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FLORA

OF

THE UPPER GANGETIC PLAIN.

AND OF THE

52705

ADJACENT SIWALIK AND SUB-HIMALAYAN TRACTS.

B.2229

BY

J. F. DUTHIE, B.A., F.L.S.,
FORMERLY DIRECTOR OF THE BOTANICAL DEPARTMENT OF NORTHERN INDIA.

RANUNCULACEÆ TO CORNACEÆ.

CALCUTTA:
OF THE SUPERINTENDENT OF GOVERNMENT PRINTING, INDIA.
1903.

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8, HASTINGS STREET.

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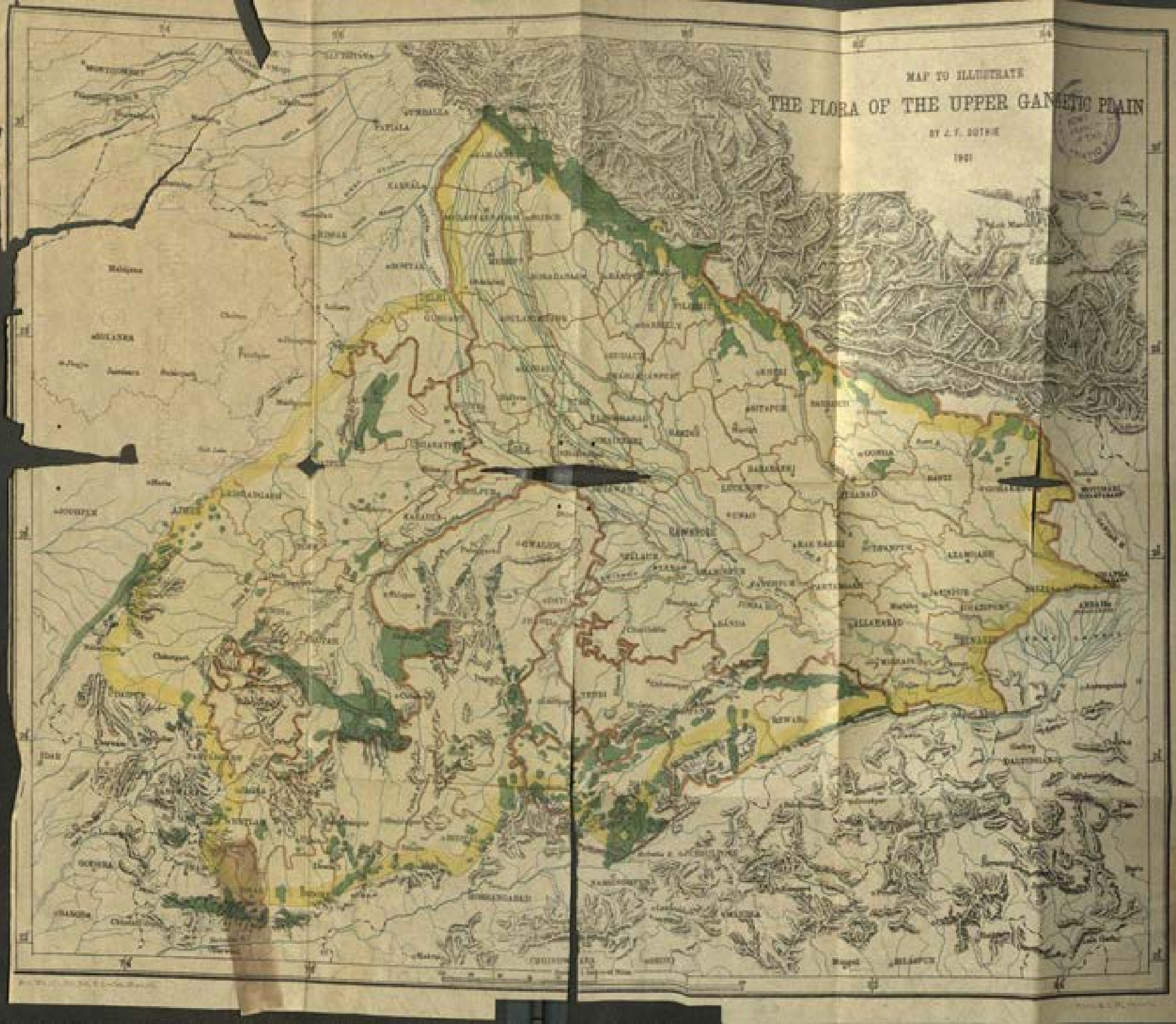
MAP TO ILLUSTRATE
THE FLORA OF THE UPPER GANGETIC PLAIN
BY J. F. DUTHIE
1903

PREFACE.

THE area dealt with in this Flora amounts approximately to 196,000 square miles. It is bounded on the north and north-east by a portion of the main chain of the Western Himalaya, and on the east by Bengal. On the south and south-west the boundary follows the watershed, from which all the rivers west of the Son, and flowing into the Ganges and Jumna from these directions, take their rise. The watershed extends along the northern slopes of the numerous groups of hills known collectively as the Vindhya mountains, and which separate the Gangetic Plain from the Narbada Valley. Mount Abu, a solitary outlier of the Aravalli Hills, and rising to 5,653 feet above the sea, is not included. The area, thus defined, contains the whole of the Upper Gangetic Plain as far as the confines of Bengal, also the Siwalik range of hills, and the Sub-Himalayan tracts from the Jumna to the Gandak. The large piece of country lying to the south-west of the Gangetic Plain proper includes a portion of Bághelkhand in Central India, also Bundelkhand, the Malwa plateau, Eastern Rajputana, and a small piece of the W. Punjab in the neighbourhood of Delhi. In thus attempting to secure a satisfactory geographical area, it was impossible to avoid clashing with political boundaries. It will be noticed, however, on referring to the map, that all the districts of the United Provinces of Agra and Oudh south of the Himalaya are represented. The inclusion of Dehra Dun, as well as of other portions of the submontane tracts of Garhwal, Kumaon and Nepal, may be objected to as being an encroachment on the Himalayan region, but the difficulty was to find any continuous and workable boundary line outside the base of the Himalaya proper. It should also be borne in mind that a writer of a Flora of the Western Himalaya might not be willing to take these particular tracts into his

area; their inclusion, therefore, in this Flora will, at any rate, prevent the risk of their being altogether undealt with.

Volume I carries the descriptions of the natural orders, genera and species to the end of *Campanulaceæ*, and the second volume will contain the natural orders from *Plumbagineæ* to *Gramineæ*, also the index to both volumes. A few remarks on the history of botanical research within the area will be given in an appendix, together with a brief account of the physical features of the country in relation to plant distribution. References to the books consulted, and my acknowledgments to all who have kindly assisted me in the preparation of this Flora will also appear in the second volume. I wish, however, to take the first opportunity of expressing my gratitude to Sir Joseph Hooker for his unfailing kindness and encouraging help during the twenty-eight years I have had the privilege of his friendship; also to my friends Sir George King, late Director of the Botanical Survey of India, and Dr. Prain, his successor, for allowing me free access to the magnificient herbarium and library in the Royal Botanic Garden at Sibpur, as well as for numerous acts of kindness during my frequent visits to Calcutta.

GLOSSARY

OF

BOTANIC TERMS.

THE following list, which is based mainly on Mr. B. Daydon Jackson's very complete Glossary published in 1901, includes also the meanings of several specific epithets mentioned in this Flora :—

Abortive :—imperfectly developed.
Acaulis :—without a stem.
Accrescent :—enlarging with age, as the calyx of the *Cape-gooseberry*.
Accumbent :—applies to cotyledons which have their edges lying against the radicle, as in many *Cruciferæ*.
Achene :—a hard, dry, indehiscent carpel, as in *Ranunculus*; also applied to the fruit of *Compositæ*, which is really composed of two combined carpels adnate to the calyx.
Achlamydeous :—applied to flowers, without a perianth, as in willows.
Acicular :—needle-shaped, like the leaves of many conifers.
Acotyledonous :—applied to plants such as *Cuscuta*, which have no seed-leaves or cotyledons.
Actinomorphic :—having flowers of a regular shape, such as may be bisected in two or more planes into similar halves.
Aculeate :—armed with prickles like the stem of a rose.
Acuminate :—with a gradually tapering point.
Acute :—with a sharp-pointed apex.
Adhesion :—the attachment or union with some other organ or part, such as calyx with ovary, stamens with corolla.
Adnate :—used to denote attachment of any organ by its whole length, as anther-lobes to the filament, a stipule to the petiole, or the calyx to the ovary.
Adventitious :—applied to roots which are not formed from the radicle of the embryo; or to abnormal buds such as are not produced in the axils of leaves.
Aggregate :—applied to flowers in dense heads like those of *Cuscuta Echinops*, etc.; also to carpels as in *Ranunculus*.
Alatus :—winged.
Albumen :—the nutritive substance found in many seeds, and very often surrounding the embryo. *See* Endosperm.
Alopecuroides :—like the tail of a fox.
Alternate :—applied to leaves which are placed one above the other in different vertical lines, also to parts of a flower, as when stamens are placed between the petals, and the petals are between the sepals.

Amphitropous :—said of an ovule when it is curved so that both ends are brought near together.
Amplectens :—embracing.
Amplexicaul :—applied to a leaf or other organ which embraces the stem at its base.
Anatropous :—applied to an ovule which has become inverted, so that the micropyle adjoins the hilum, and the chalaza occupies the opposite end.
Androecium :—a term given to the stamens collectively.
Angiosperms :—plants which have their seeds inclosed in an ovary.
Annual :—applied to plants which germinate and produce flowers and seed and then die within a single season or year.
Anther :—that portion of a stamen which contains the pollen; usually attached to a stalk (filament), or sessile. It is generally composed of two lobes from which the pollen escapes either by slits, valves or pores.
Aphyllous :—without leaves.
Apetalous :—without petals, in which case the sepals often become petal-like as in *Clematis*.
Apocarpous :—when the carpels of a gynæcium are quite free.
Appressed :—applied to a leaf or other organ which lies flat for its whole length against another organ; also refers to hairs.
Apricus :—inhabiting sunny places.
Apterous :—wingless.
Arborescent :—attaining the size of a tree or resembling one.
Arcuate :—curved, or bent like a bow.
Arenarius :—growing in sandy places.
Argentens :—silvery.
Aril :—an expansion of the funicle arising from the placenta, and more or less enveloping the seed.
Arista :—*See* Awn.
Aristate :—Awned.
Armed :—provided with thorns or prickles.
Arrhizus :—without roots.
Articulated : jointed.
Arvensis :—applied to plants of arable land.
Asexual :—having neither male nor female organs; neuter.
Asper :—rough.
Auricle :—an ear-like appendage to a leaf or other organ.
Awn :—a bristle-like appendage, frequently occurring on the glumes of grasses.
Axil :—the angle formed between the axis and any organ attached to it, such as a leaf.
Axillary :—borne in an axil.

Baccate :—having a fleshy fruit.
Barbatus :—bearded.
Belophyllus :—with arrow-shaped leaves.
Berry :—a fruit pulpy throughout and with the seeds immersed, like a grape.
Bicarinatus :—with two keels.
Biennial :—applied to a plant which requires two years to complete its life-cycle, usually flowering and fruiting during the second year
Bifarious :—*See* Distichous.
Bifid :—cleft halfway into two.
Bifoliate :—two-leaved.
Bifoliolate :—with two leaflets.
Bilabiate :—two-lipped.
Bipartite :—divided almost to the base into two parts.
Bipinnate :—when the secondary as well as the primary divisions of a leaf are pinnate.
Bipinnatifid :—when the lobes of a pinnatifid leaf are also pinnatifid.
Bisexual :—when both stamens and pistils are present in the same flower.

Blade :—the flat or expanded part of a leaf.
Brachiate :—applied to spreading and divergent branches.
Brachycarpus :—short-fruited.
Brachystachyus :—with short spikes.
Bracteate :—provided with bracts.
Bracteole :—a small bract of a single flower of an inflorescence.
Bracts :—modified leaves between the calyx and the true leaves; often forming an involucre as in *Compositæ*, sometimes coloured.
Bulb :—an arrested usually underground branch, with modified leaves bearing axillary buds, as in the onion.
Bulbiferous :—bearing bulbs,
Bulbil :—a small bulb, usually applied to such as are produced in the leaf-axils of some *Dioscoreas* and lilies.
Bulblet :—*See* bulbil.
Bullate :—having a blistered appearance.

Caducous :—dropping off early or prematurely.
Caerulescent :—verging towards blue.
Caesious :—of a light greyish tint.
Calcarate :—provided with a spur.
Calceolaris :—shaped like a shoe.
Callose :—furnished with hard projections.
Callus :—a hard projection, sometimes applied to an extension of the flowering glume below its point of insertion, and adnate to the axis or rhachilla of the spikelet.
Calycifloræ :—plants which have their petals and stamens adnate to the calyx.
Calyciform :—cup-shaped.
Calycine :—belonging to or resembling a calyx, also applied to a calyx of unusual size.
Calyculate :—bearing a calyx-like involucre outside the true calyx.
Calyptrate :—when the calyx or corolla separates from the flower in the form of a cap, as in some *Myrtaceæ*.
Calyx :—the outer floral envelope.
Campanulate :—bell-shaped
Campestris :—growing in fields.
Campylotropal :—applied to an ovule which becomes curved during its growth so as to bring its micropyle end near to the hilum.
Candicans : -white.
Canescens :—becoming grey or hoary.
Canus :—grey or hoary.
Capillaceous :—slender, like a hair.
Capitellate :—diminutive of capitate.
Capitate :—head-shaped as with some stigmas, or collected into a head like the flowers of *Compositæ*.
Capreolate :—furnished with tendrils.
Capsule :—a dry, dehiscent seed-vessel consisting of more than one carpel.
Carinatus :—keeled.
Cariopsis :—applied to the fruit of a grass, which is 1-celled and 1-seeded, and the pericarp adheres to the seed.
Carnosus :—fleshy.
Carpel :—a simple pistil or a component of a compound pistil. In *Leguminosæ* the pistil consists of a single free carpel, whilst the orange has a compound pistil with several carpels combined.
Caruncle :—an excrescence at or near the micropyle end of some seeds, as in Castor oil. *See* Strophiole.
Catkin :—a deciduous spike of unisexual flowers, as in oaks and willows.
Caudate :—tailed.

Caudicle:—the stalk of a pollinium, as in many orchids.
Caulescent:—becoming stalked.
Cauline:—belonging to the stem.
Centrifugal:—developing or opening from the centre outwards, like the general inflorescence of *Compositæ*.
Centripetal:—developing or opening towards the centre from without, like the individual flowers in the heads of *Compositæ*.
Cernuous:—nodding.
Chalaza:—the part of the ovule where the coats of the nucleus are confluent.
Ciliate:—furnished with hairs forming a fringe-like eye-lashes.
Cinerascens:—becoming ash-coloured.
Cinereous:—ash-coloured.
Circinnate:—involute from the tip into a coil, like the young fronds of a fern, and in many tendrils.
Coarctatus:—crowded together.
Circumscissile:—cut or splitting transversely, like the capsule of henbane or amaranth.
Cirrhose:—furnished with tendrils
Class:—a primary group of Natural orders, *e.g.* Dicotyledons.
Clavate:—club-shaped.
Claw:—the narrowed base of a petal.
Cleft:—cut half-way down.
Cleistogamic:—applied to flowers which become fertilized without opening.
Clinandrium:—the part of the column in orchids where the anther lies.
Coccus:—a one-seeded separable portion of a lobed fruit.
Cochleate:—shaped like a spiral shell.
Collateral:—placed side by side.
Collinus:—growing on hills.
Column:—the stalk of the combined styles and stamens of orchids; also applied to the combined filaments of *Malvaceæ*.
Coma:—a tuft of hairs, applied to such as are found attached to the seeds of willows and of *Asclepiadaceæ*.
Commissure:—the face of union of two carpels, as in *Umbelliferæ*.
Comose:—with tufts of hair.
Complanate:—compressed or flattened.
Concinnus:—neat or elegant.
Concolorous:—of one colour.
Conduplicate:—folded together lengthwise.
Cone:—*See* Strobile.
Confluent:—blended or blending into one.
Connate:—applied to members of the same whorl when united.
Connective:—the part of a stamen which connects the anther-lobes.
Connivent:—coming into contact or converging.
Convolute:—rolled up longitudinally, so that one margin is inside and enveloped by the other.
Cordate:—heart-shaped.
Coriaceous:—leathery.
Corm:—a bulb-like fleshy stem or base of a stem.
Corniculate:—furnished with one or more little horns.
Cornute:—horned or spurred.
Corolla:—the interior perianth, composed of free or combined petals.
Corolline:—like a corolla, or attached to a corolla.
Corona:—an extra whorl of bodies representing outgrowths from the corolla or the stamens, as in *Asclepidaceæ* and in the passion-flowers. Compare with ligule.
Corrugate:—wrinkled.
Corymb:—an inflorescence, which has the lower flower-stalks longer than the upper, so as to bring all the flowers to about the same level. In most of the *Cruciferæ* the flowers are arranged in corymbs, which change to racemes when in fruit.
Corymbose:—arranged in corymbs.

Costate:—furnished with one or more primary veins or ribs.
Cotyledon:—applied to the seed-lobes or primary leaves of the embryo.
Crassifolius:—with thick, fleshy leaves.
Crateriform:—shaped like a shallow cup.
Cremocarp:—a dry and seed-like fruit composed of two 1-seeded carpels invested by an epigynous calyx, separating when ripe into two mericarps, as in *Umbelliferæ*.
Crenate:—having rounded teeth.
Cruciferous:—applied to flowers like those of *Cruciferæ* which have cruciform corollas of 4 petals.
Crustaceous:—of brittle texture.
Cryptogamic:—applied to plants which do not produce stamens and pistils and true seeds.
Cucullate:—hood-shaped.
Culm:—the hollow stem or straw of grasses.
Cuneate:—wedge-shaped.
Cupular:—shaped like a small cup.
Cupule:—the cup of fruits like the acorn.
Cusp:—a sharp rigid point.
Cuspidate:—tipped with a cusp.
Cymbiform:—boat-shaped.
Cyme:—an inflorescence of determinate or centrifugal type, usually spreading and flattened; but there are many varieties, and some of these simulate those of the indeterminate or centripetal type.

Decandrous:—having ten stamens.
Deciduous:—falling at normal periods. *See* Caducous.
Declinate:—bent or curved downward or forward.
Decompound:—divided several times.
Decumbent:—reclining, but with the summit ascending.
Decurrent:—applied to leaves which run down the stem and appear to be prolonged below their insertion.
Decussate:—in pairs alternately at right angles.
Definite:—of a limited number, as when the stamens are less than twenty; also applied to a cymose inflorescence where the axis ends in a flower.
Dehiscence:—the mode of opening of a carpel or capsule, or of an anther by slits, pores or valves.
Demersus:—submerged.
Denticulate:—minutely toothed.
Diadelphous:—having stamens in two bundles.
Dichlamydeous:—having both calyx and corolla.
Dichotomous:—forked in pairs.
Diclinous:—applied to unisexual flowers.
Dicotyledons:—plants of the class distinguished by having two cotyledons.
Didymous:—in pairs.
Didynamous:—applied to flowers with four stamens in pairs, and one pair shorter than the other.
Diffuse:—widely or loosely spreading.
Digitate:—applied to a compound leaf, of which all the leaflets are borne on the apex of the petiole.
Dimerous:—applied to cycles or whorls consisting of two parts.
Dimidiate:—halved, or as if one half were wanting.
Dimorphic:—occurring under two forms, as long-styled and short-styled, flowers in the same species.
Dioecious:—unisexual plants with male flowers and female flowers on separate individuals.
Discolor:—of different colours.
Disk:—a development of the torus within the calyx or within the corolla and stamens; the central portion of the head of flowers in *Compositæ*, or the whole head, if

the flowers are regular and homogamous; the expanded base of the style in *Umbelliferæ*.

Dissepiment:—a partition in an ovary or pericarp resulting from the cohesion of the sides of the carpels; sometimes spurious as in *Cruciferæ* and *Cassia Fistula*.

Distachyus:—with two spikes.

Distichous:—applied to leaves arranged in two ranks, and to the florets of many grasses.

Divaricate:—very divergent.

Dodecandrous:—having 12 (or from 12-19) stamens.

Dorsal:—relating to or attached to the back.

Drupaceous:—resembling or relating to a drupe.

Drupe:—a fleshy fruit with a hard endocarp which incloses the seed, as in a plum.

Dumetorum:—bushy or relating to bushes.

Eburneus:—ivory-white.

Echinate:—beset with prickles.

Effuse:—expanded or loosely spreading.

Elliptic:—shaped like an ellipse.

Emarginate:—often applied to leaves or petals which are notched at the apex.

Embryo:—the rudimentary plantlet formed in the seed.

Endocarp:—the inner layer of a pericarp

Endosperm:—the albuminous part of a seed often limited to what has been formed within the embryo-sac.

Enneandrous:—with nine stamens.

Ensiform:—sword-shaped.

Entire:—with an even untoothed margin.

Epicalyx:—an involucre of bracts resembling an outer calyx, as in some *Malvaceæ* and in *Potentilla*.

Epicarp:—the outer layer of a pericarp.

Epichile:—the terminal portion of the lip of an orchid when distinct from the basal part.

Epigynous:—on or apparently above the ovary, as when the calyx is adnate to it.

Epipetalous:—on the petals or corolla.

Epiphyte:—growing on another plant, sometimes called air-plant, such as many of the orchids and the *Scitamineæ*.

Equitant:—when leaves are placed as if astride one another, as in *Iris*.

Erianthus:—with woolly flowers.

Eriocarpus: with a woolly fruit.

Erose:—irregularly toothed, as if bitten.

Everted:—turned inside out.

Exilis:—lank and straight.

Explanatus:—flattened out.

Extrorse:—directed outwards.

Falcate:—sickle-shaped.

Fascicle:—a cluster or bundle.

Fastigiate:—applied to branches which are arranged in somewhat parallel clusters.

Ferruginous:—rust-coloured.

Filament:—a thread-like body, as the stalk of an anther.

Fimbriate:—having a margin bordered with slender processes.

Fistular:—hollow throughout its length, like the leaf and stem of an onion.

Flabellate:—fan-shaped.

Flagellate:—provided with whip-like runners.

Flagelliform:—like the lash of a whip.

Flavidus:—yellowish.

Fluitans:—floating.

Foliaceous:—having the texture of or resemblance to a leaf.

Foliolose:—closely covered with leaflets

Follicle:—a fruit of one carpel, dehiscing by the ventral suture.

Foveolate:—impressed with small pits.
Fruit:—the matured pericarp and its contents, together with any external integral portion of it.
Frumentaceous:—relating to grain.
Frutescent:—becoming shrubby.
Fruticose:—shrubby.
Fugacious:—falling or fading early.
Funicle:—the stalk or chord which connects the ovule or seeds to the placenta.
Funiculatus:—thread-like.
Furcate:—forked.
Furrowed:—grooved.
Fuscous:—greyish-brown.
Fusiform:—spindle-shaped.

Gamopetalous:—with united petals.
Gamophyllous:—applied to a perianth with united segments.
Gamosepalous:—with united sepals.
Geminate:—in pairs.
Geniculate:—abruptly bent.
Genus:—a natural group consisting of one or more species, and which with the species gives the name to a plant.
Gibbous:—a pouch-like enlargement at the base of an organ, as of a calyx.
Glabrous:—smooth.
Glabrescent:—becoming glabrous or nearly so.
Gladiate:—shaped like a sword.
Gland:—a definite secreting structure on the surface of an organ, embedded or ending in a hair; or any gland-like non-secreting protuberance. A viscid enlargement at the base of the stalk of a pollinium in orchids and *Asclepiadaceæ*. Another name for an acorn.
Glandular:—furnished with glands.
Glaucous:—sea-green.
Globose:—somewhat spherical.
Glochidiate:—clothed with barbed bristles.
Glomerate:—compactly clustered.
Glumaceous:—resembling glumes, like the perianth of rushes (Juncus).
Glume:—One of the chaff-like bracts which characterize the inflorescence of grasses and sedges and *Eriocaulon*.
Graveoleus:—unpleasantly strong-scented.
Gregarious:—associated, or growing in company.
Guttatus:—spotted.
Gymnospermæ:—the class, including the conifers, which have naked ovules.
Gynandrous:—applied to stamens which are adnate to the pistil, as in orchids.
Gynobasic:—applied to a style which adheres by its base to a prolongation upwards of the torus between the carpels, as in *Labiatæ*.
Gynœcium:—the pistil or carpels of a flower collectively.
Gynophore:—an elongation of the receptacle, forming a stipe or stalk to the pistil.

Habit:—the general appearance of plant.
Habitat:—the kind of locality in which a plant grows.
Hamose:—hooked.
Hastate:—shaped like the head of a spear.
Helicoid:—coiled like a snail-shell.
Heptandrous:—having seven stamens.
Herbaceous:—applied to plants which do not form a persistent woody stem.
Hermaphrodite:—with stamens and pistil in the same flower.
Heterogamous: bearing two kinds of flowers, as in some *Compositæ* and *Umbelliferæ*.

Hexandrous:—with six stamens.
Heterophyllous:—having differently shaped leaves on the same plant.
Hilum:—the scar left on a seed where it was attached to the funicle or placenta.
Hirsute:—pubescent, with rather long, stiff hairs.
Hirtus:—hirsute.
Hispid:—clothed with stiff hairs or bristles.
Hispidulous:—minutely hispid.
Homagamous:—when the flowers in a head (as in *Compositæ*) are all alike.
Humifuse:—spread on the surface of the ground.
Humilis:—lowly.
Hyalin:—colourless or translucent.
Hypochil:—the basal portion of the lip of an orchid.
Hypocotyl:—the axis of the embryo below the cotyledons.
Hypocrateriform:—salver-shaped.
Hypogynous:—inserted beneath the gynæcium or pistil.
Hypoleucus:—applied to leaves with the lower surface white.

Icosandrous:—with twenty or more stamens.
Imbricate:—overlapping.
Imparipinnate:—pinnate with an odd terminal leaflet.
Incanus:—grey or hoary.
Incised:—cut sharply and irregularly.
Incumbent:—leaning upon, applied to cotyledons when the back of one rests, against the radicle.
Indefinite:—more than can easily be counted, as the stamens in a flower; also applied to an inflorescence the main axes of which elongate indefinitely, as in a raceme; also known as indeterminate centrifugal or acropetal.
Indehiscent:—not opening in a regular manner.
Induplicate:—with the edges folded inwards.
Inflorescence:—the arrangement of flowers on an axis.
Infundibuliform:—funnel-shaped.
Innate:—borne on the apex of the supporting part.—*See* Adnate.
Innovation:—applied to a vigorous shoot which carries on the further growth of the plant, as in many grasses.
Internode:—the portion of a stem between two nodes.
Integrifolius:—with entire leaves.
Interpetiolar:—between the petioles, like the stipules of Rubiaceæ.
Intrapetiolar:—within the petiole or between it and the stem.
Introrse:—turned inwards towards the axis.
Involucel:—an inner or secondary involucre, as in *Umbelliferæ* with compound umbels.
Involucre:—a whorl of bracts surrounding several flowers, as in *Umbelliferæ* and *Compositæ*.
Involute:—rolled inward.

Junceus:—rush-like.

Labiate:—lipped, usually 2-lipped, as in *Labiatæ*.
Lacerus:—torn.
Laciniate:—cut into narrow lobes.
Lacunose:—with pits or depressions, like the leaves of *Berberis asiatica*.
Lagopus:—like a hare's foot.
Lævigate:—smooth as if polished.
Lanate:—woolly.
Lanceolate:—shaped like a lance or spear-head, or narrowly ovate and tapering to both ends.
Lanuginose:—woolly or cottony.
Lappaceus:—bur-like.
Lasiocarpus:—with pubescent fruit.
Latebrosus:—hidden.

Legume:—the characteristic seed-vessel of *Leguminosæ*, one-celled and two-valved.
Lepidote:—beset with small scurfy scales.
Leptostachyus:—with slender spikes.
Ligneous:—woody.
Ligule:—the thin scarious often hairy projection from the top of the leaf-sheath in grasses; also applied to the strap-shaped limb of the ray-florets in *Compositæ*.
Ligulate:—furnished with a ligule.
Limb:—the expanded portion of a gamopetalous corolla; also applied to the expanded portion of a leaf or petal.
Linear:—several times longer than wide, and with parallel sides.
Lineate:—marked with lines.
Lip:—one of the two divisions of a bilabiate calyx or corolla; also applied to the usually large third petal of orchids.
Loculicidal:—dehiscent by the back, *i.e.*, the dorsal suture.
Lodicule:—one of the minute scales found outside the stamens in the flowers of grasses, and which may represent a perianth.
Loment:—a legume which is constricted between the seeds, or which separates into one-seeded joints.
Lorate:—thong-shaped.
Lunate:—half-moon shaped.
Lyrate:—lyre-shaped, applied to a pinnatifid leaf with the terminal lobe rounded and much larger than the lower ones.

Macrophyllus:—with long leaves.
Macropodous:—applied to an embryo with an enlarged hypocotyl.
Macrostachyus:—with long spikes.
Marcescent:—withering without falling off.
Mentum:—an extension at the foot of the column in some orchids, and projecting in front of the flower.
Micranthus:—with small flowers.
Microphyllus:—with small leaves.
Monadelphous:—when the anthers are united by their filaments into a tube or column.
Monandrous:—having one stamen.
Moniliform:—necklace-shaped.
Monochlamydeous:—with only a single whorl to represent the perianth.
Monocotyledons:—plants of the class distinguished by having only one cotyledon.
Monœcious:—with stamens and pistils in separate flowers on the same plant.
Monticolus:—inhabiting mountains.
Mucronate:—tipped with an abrupt point.
Multiceps:—with many heads.
Multifid:—cleft into many lobes or segments.
Muralis:—growing on walls.
Muricate:—rough with hard tubercles.
Muticous:—blunt, awnless.
Myurus:—tapering like a mouse's tail.

Nanus:—dwarfed.
Nemoralis:—inhabiting woods.
Nerve:—one of the primary ribs of the vascular framework of a leaf, of which the central, or the one extending from base to apex, is known as the midrib.
Nigrescent:—turning black.
Niveus:—snowy white.
Node:—the part of a stem which normally bears a leaf or a whorl of leaves.
Nudicaulis:—having stems without leaves, naked-stemmed.
Nut:—a hard, indehiscent, one-seeded fruit.
Nutans:—nodding.

Nutlet:—diminutive of nut, often applied to the small separable portions of a four-lobed fruit as in many *Labiatæ*.

Obcordate:—heart-shaped, with the notch at the apex.
Oblate:—flattened at both ends.
Obovate:—ovate with the broader end towards the apex.
Ocellate:—with a patch or ring of colour.
Ocreate:—provided with ocreæ or tubular stipules.
Octandrous:—having eight stamens.
Officinalis:—used of medicinal or other plants procurable at shops.
Offset:—a lateral shoot used for propagating.
Oleraceus:—of the nature of a potherb.
Operculate:—furnished with an operculum or lid like the corolla of some *Myrtaceæ*, or a capsule which splits transversely. *See* Circumscissile.
Order:—a systematic group of genera.
Ornithopodus:—shaped like a bird's foot.
Orthotropal:—used of an ovule with a straight axis, the chalaza at the insertion, and the micropyle at the end furthest from the hilum.
Oval:—broadly elliptic.
Ovary:—the portion of the pistil containing the ovules.
Ovate:—shaped like an egg, the broader end at the base.
Ovule:—the young seed in the ovary before fertilization.

Pachyrachis:—with a thick rhachis.
Pale:—the chaff-like scales on the floral receptacles of many *Compositæ*; also applied to the inner bract or glume of the flowers of grasses.
Palmate:—lobed in the form of a hand.
Palmatifid:—cleft in a palmate fashion.
Palmatipartite:—palmately divided nearly to the base.
Palustris:—growing in swampy ground.
Panduriform:—fiddle-shaped.
Panicle:—like a raceme or corymb, with branching pedicels.
Paniculate:—bearing panicles.
Papilionaceous:—applied to the butterfly-shaped corolla of the sub-order *Papilionaceæ* of *Leguminosæ*.
Papillose:—covered with minute superficial projections.
Pappose:—furnished with pappus.
Pappus:—a ring of hairs or scales, which represents the calyx-limb at the apex of the fruit in *Compositæ*.
Parasite:—a plant which grows upon and obtains its nourishment from another plant (its host), such as *Cuscuta* and *Loranthus*.
Parietal:—borne on or relating to a wall.
Parted:—cleft nearly to the base.
Patent:—spreading.
Pectinate:—pinnatifid like a comb, with narrow close-set segments.
Pedate:—palmately divided or parted, with the lateral segments two-cleft, like a bird's claw.
Pedicel:—one of the ultimate branchlets of a compound inflorescence.
Pedicellate:—bearing pedicels.
Peduncle:—the stalk of a flower or of a cluster of flowers.
Pedunculate:—pedunculed or borne on a foot stalk.
Pellucid:—transparent or translucent.
Peltate:—target-shaped, applied to an organ attached by its lower surface instead of at the base or by the margin, as in *Cissampelos* and *Nymphæaceæ*.

Penicillate:—shaped like a little brush.
Penninerved:—pinnately veined.
Pentadelphous:—having the stamens in five bundles.
Pentagynous:—with five pistils or styles.
Pentamerous:—composed of five members.
Pentandrous:—having 5 stamens.
Perennial:—a plant which lives for several years, not dying after flowering and fruiting once.
Perfect:—applied to a hermaphrodite flower.
Perfoliate:—applied to a leaf when the stem apparently passes through it.
Perianth:—the floral envelopes, calyx or corolla, or both.
Pericarp:—the wall of the fructified ovary.
Perisperm:—the ordinary albuminous part of a seed, often restricted to that which is formed outside the embryo sac. *See* Endosperm.
Pertusus:—perforated.
Petal:—the separate or united parts of a corolla.
Petiolate:—furnished with a petiole.
Petiole:—the footstalk of a leaf.
Petiolule:—the petiole of a leaflet.
Phœnogams:—having manifest flowers, in contradistinction to Cryptogams.
Phanerogams:—*See* Phœnogams.
Phœniceus:—scarlet.
Phyllode:—a petiole which takes the form and performs the functions of a leaf.
Pictus:—marked with colour as though painted.
Pinnate:—when leaflets are arranged on each side of a common petiole.
Pinnatifid:—pinnately cleft.
Pinnatipartite:—pinnately parted.
Pinnatisect:—pinnately parted down to the rhachis.
Pinnule:—one of the primary divisions of a bipinnate leaf.
Pisiform:—pea-shaped.
Pistil:—the female organs of a flower collectively; in its simplest form it consists of a single carpel, as in the pea, with style and stigma, the style being sometimes not present.
Placenta:—the place or process in the ovary to which the ovules are attached.
Platycarpus:—with a broad fruit.
Platyphyllus:—broad-leaved.
Plicate:—folded into plaits.
Plumule:—the primary leaf-bud in an embryo.
Pod:—the same as legume, but often applied to many pod-like many-seeded indehiscent fruits.
Podocarpus:—with a stalked fruit.
Pollen:—the fertilizing dust-like grains formed inside the anthers of flowering plants.
Pollinium:—a more or less coherent mass of pollen-grains, as in *Asclepiadaceæ* and in orchids.
Polyadelphous:—having the stamens in many bundles.
Polyandrous:—having an indefinite number of stamens.
Polycephalus:—with many heads.
Polygamous:—with unisexual and hermaphrodite flowers on the same plant.
Polygamo dicœcious:—dicœciously polygamous.
Polymorphic:—variable as to shape or habit.
Polypetalous:—having separate petals.
Polyrhizus:—with many roots.
Polysepalous:—having separate sepals.
Precatorius:—referring to prayer, as the seeds of *Abrus* which are made into rosaries.
Procerus:—very tall.
Proliferous:—bearing progeny as offshoots.

Prostrate:—lying flat on the ground.
Protandrous:—when the anthers of a flower become mature earlier than the stigma.
Pruriens:—causing an itching sensation.
Puberulous:—slightly or minutely hairy.
Pubescent:—clothed with soft hair or down.
Pulverulentus:—powdered as if dusted.
Pulvinatus:—cushion-shaped.
Pulvinus:—a swelling close under the insertion of a leaf, or the swollen base of a petiole.
Pumilus:—low or little.
Pusillus:—small or slender.
Pyrene:—a nutlet, as in *Labiatæ*; also applied to the small stones of a drupe.

Quadrifarius:—in four ranks.
Quinquelocular:—five-celled.

Raceme:—an indefinite form of inflorescence, with an elongating axis and pedicels equal in length.
Racemose:—bearing racemes, or raceme-like.
Radical:—proceeding from or near the root.
Radicle:—the primary root of a seed-plant.
Raphe:—the adnate funicle of an anatropous ovule, connecting the hilum with the chalaza, it may be ventral (turned towards the axis) or dorsal (on external face of ovule).
Ray:—the marginal portion of a head or cluster of flowers when distinct, as in some *Compositæ* and *Umbelliferæ*; also applied to the radiating branches of an umbel.
Receptacle:—usually applied to the axis of a flower, that which supports the sepals, petals, stamens and pistil; also called torus or thalamus.
Regular:—when the parts of each whorl in a flower are alike. *See* Actinomorphic.
Reniform:—kidney-shaped.
Repand:—with slightly uneven margin, not quite sinuate.
Repens:—prostrate and rooting.
Replum:—a frame-like placenta, from which the valves of a capsule or other dehiscent fruit fall away as in *Cruciferæ* and *Mimosa*.
Resupinate:—upside down, or appearing so.
Reticulate:—in the form of network.
Retinaculum:—the gland to which one or more pollinia are attached in orchids, applied also to the hook-like funicle as in many of the *Acanthaceæ*.
Retrorse:—directed backward or downward.
Retuse:—with a shallow notch at a rounded apex.
Rhachilla:—a secondary axis in the inflorescence of grasses.
Rhachis:—the axis of an inflorescence or of a compound leaf.
Rhizome:—a rootstock or stem of root-like appearance, prostrate or underground, and giving off rootlets, the apex progressively sending up stems or leaves.
Rhomboid:—approaching a rhombic in outline; quadrangular with the lateral angles obtuse.
Rib:—a primary vein.
Rostellate:—somewhat beaked.
Rostellum:—a narrow extension of the upper edge of the stigma of certain orchids, the abortive anterior lobe.
Rostrate:—beaked.
Rosulate:—collected in a rosette.
Rotate:—wheel-shaped, applied to a spreading gamopetalous corolla with a short tube.
Ruderalis:—growing in waste ground.
Rufous:—pale reddish-brown.
Rugose:—wrinkled.

Rugulose:—somewhat wrinkled.
Ruminate:—having the appearance of being chewed, like the endosperm of the nutmeg and of many of the *Anonaceæ*.
Runcinate:—saw-toothed or sharply incised, the teeth or incisions retrorse.
Runner:—an elongated lateral shoot, rooting at intervals, often dying off at the internodes.

Sagittate:—shaped like an arrowhead.
Samara:—an indehiscent winged fruit.
Sapid:—having a pleasant taste.
Saponaceous:—soapy.
Saprophyte:—a plant which lives on dead organic matter.
Sarmentose:—producing long and flexible runners.
Sativus:—refers to a plant which has been sown or planted.
Scabrid:—roughish.
Scabrous:—rough to the touch.
Scandent:—climbing.
Scape:—a leafless flower-stalk rising direct from the rootstock, as in *Eriocaulon*.
Scapigerous:—with flowers borne on a scape.
Scarious:—thin, dry and membranous, not green.
Scorpioid:—refers to a form of unilateral cymose inflorescence which is circinately coiled in the bud, strictly with flowers two-ranked, these being alternately thrown to right and left.
Scrobiculate:—marked by minute or shallow depressions.
Sebiferous:—producing vegetable wax.
Secund:—when parts or organs are directed to one side only.
Seed:—the fertilized and matured ovule.
Sepal:—is the name given to each segment, whether free or combined, composing the calyx.
Sepaloid:—resembling a sepal.
Sepiarius:—referring to hedges.
Septicidal:—when a capsule dehisces through the dissepiments or lines of junction.
Septifragal:—when the valves in dehiscence break away from the dissepiments.
Seriate:—disposed in rows, either transverse or longitudinal.
Sericeus:—clothed with silky appressed hair.
Serotinus:—produced late in the season.
Serrate:—margined with teeth directed forwards.
Serrulate:—finely serrate.
Sessile:—without a stalk.
Seta:—a bristle or bristle-shaped body.
Setaceous:—bristle-like.
Setiferous:—bearing bristles.
Setose:—bristly.
Sigmoid:—doubly curved like the letter S.
Siliqua:—a kind of pod characteristic of the *Cruciferæ*, the two valves of which fall away from the frame (replum), to which the seeds are attached, and across which a false partition is formed.
Sinuate:—with a deep, wavy margin.
Spadix:—a spike with a fleshy axis, often restricted to an inflorescence like that met with in aroids, the flowers of which are unisexual and the spike is generally enclosed within a spathe.
Spathe:—a large bract inclosing the inflorescence, as in Arisæma.
Spathulate:—obovate with the lower end attenuated.
Spike:—a form of indefinite inflorescence with the flowers sessile on an elongated common axis.
Spikelet:—a secondary spike; also applied to ultimate clusters of florets as in grasses, the clusters of which are subtended by a common pair of glumes.

Spine:—a sharp-pointed woody or hardened body, usually a branch, sometimes a petiole, stipule or other part of a leaf.
Spinose:—furnished with spines.
Spur:—a hollow extension of some part of the flower, usually nectariferous.
Squamose:—scaly or scale-like.
Squarrose:—rough with spreading and projecting processes.
Stamen:—one of the component parts of the androecium or male element of a flower, consisting of filament and anther or of the latter only.
Staminal:—relating to the stamens.
Staminode:—a sterile or abortive stamen.
Standard:—the posterior and usually the most conspicuous petal of a papilionaceous corolla.
Stenocarpus:—having a narrow fruit.
Stenophyllus:—with narrow leaves.
Stictophyllus:—having leaves covered with raised points.
Stigma:—that part of the pistil which receives the pollen.
Stipe:—a stalk, often applied to the stalk-like support of a carpel or gynoecium.
Stipel:—an appendage to a leaflet, analogous to the stipule of a leaf.
Stipellate:—furnished with stipels.
Stipitate:—having a stipe or special stalk.
Stipular:—relating to stipules.
Stipulate:—bearing stipules.
Stipule:—an appendage at the base of a leaf.
Stolon:—a sucker, runner, or any basal branch which is capable of rooting.
Stoloniferous:—provided with stolons.
Stone:—the hard endocarp of a drupe.
Strictus:—straight or erect.
Strigose:—beset with appressed, straight and stiff hairs or bristles.
Strophiole:—an appendage at the hilum of some seeds. *See* Caruncle.
Style:—the usually attenuated portion of a pistil or carpel between the ovary and the stigma.
Suaveolens:—sweet-scented.
Suberose:—of a corky texture.
Subulate:—awl-shaped.
Sucker:—a shoot of subterranean origin.
Sulcate:—grooved or furrowed.
Supinus:—prostrate with face upwards.
Surculosus:—producing suckers.
Suture:—a junction or seam of union, often indicating a line of dehiscence.
Syncarpous:—composed of two or more united carpels.
Syngenesious:—with the anthers cohering in a ring.
Synonym:—a superseded or unused name.

Tendril:—a filiform production, either cauline or foliar, by which a plant may climb.
Terete:—circular in transverse section.
Ternate:—in threes.
Ternifolius:—with the leaves in threes.
Tessalate:—chequered.
Testa:—the outer coat of a seed, usually hard and brittle.
Tetradynamous:—having four long stamens and two short, as in *Cruciferæ*.
Totragonal:—four-angled.
Tetrandrous:—with four stamens.
Tetraspermous:—with four seeds.
Thalamifloral:—when the calyx, corolla and stamens are attached to the thalamus or receptacle below the pistil.
Thalamus:—*see* Receptacle.
Thyrsus:—a contracted or ovate panicle with the main axis inde-

finite and the scondary and ultimate axes cymose.
Thyrsoid :—resembling a thyrsus.
Tomentose :—densely pubescent with wool or short hairs.
Torose :—constricted at intervals.
Torulose :—diminutive of torose.
Torus :—*See* Receptacle.
Triadelphous :—having stamens in three bundles.
Triandrous :—having three stamens.
Tricarinate :—with three keels.
Triceps :—with three heads.
Trichotomous :—three-forked.
Trifoliolate :—with three leaflets.
Trigonous :—three-angled.
Trilobate :—three-lobed.
Trilocular :—three-celled.
Trimorphic :—occurring under three forms, applied chiefly to the relative lengths of stamens.
Tripartite :—three-parted.
Tripinnate :—thrice pinnate.
Triquetrous :—with three salient angles.
Truncate :—as if cut off at the end.
Tuber :—a thickened and short subterranean branch beset with buds or eyes.
Tuberculate :—furnished with excrescences on the surface.
Tuberous :—producing tubers, or resembling a tuber.
Tumid :—swollen.
Turbinate :—shaped like a top.

Uliginosus :—growing in swamps.
Umbel :—an inflorescence, in which all the pedicels radiate from the same point, like the ribs of an umbrella.
Umbellule :—a secondary umbel.
Umbrosus :—growing in shady places.
Unarmed :—without thorns or prickles.
Uncinate :—hooked.
Undulate :—wavy.
Undershrub :—a low shrub, often with herbaceous branches which die down annually.
Urceolate :—pitcher-shaped.
Urens :—burning or stinging.
Utricle :—a small bladder-like pericarp as in *Chenopodium*; also applied to the membranous sac surrounding the fruit in *Carex*, or to any bladder-shaped appendage.

Vaginalis :—sheathed.
Valvate :—opening as if by lids or valves, like the anthers of *Berberis* and *Laurineæ*; also when the parts of a flower-bud exactly meet without overlapping.
Vein :—the branch of a nerve.
Velutinus :—velvety.
Ventral :—usually applied to the anterior or inner face of a carpel, in opposition to dorsal.
Ventricose :—inflated on one side, like the corolla of many *Labiatæ*.
Venulose :—profusely veined.
Verrucose :—warty.
Versatile :—swinging freely on its support, like the anthers of grasses.
Versicolor :—changing colour.
Verticil :—a whorl.
Verticillaster :—a false whorl composed of a pair of opposite cymes, as in many *Labiatæ*.
Vexillum :—*See* Standard.
Villous :—clothed with long soft hairs.
Vimineus :—with long flexible branches.
Virens :—green.
Virgate :—twiggy or rod-like.
Viscid :—sticky or clammy from a gummy secretion.
Vitifolius :—with leaves like those of the vine.
Vittæ :—the aromatic oil-tubes of the pericarp of most *Umbelliferæ*.
Viviparous :—germinating or sprouting from seed or bud while still attached to the parent-plant.
Volubilis :—twining.

Zygomorphic :—applied to flowers which can be divided into equal halves in one plane only. *See* Actinomorphic.

SYNOPSIS OF THE NATURAL ORDERS.

THE plan adopted for presenting the diagnoses of the Natural Orders represented in this Flora follows very closely Sir Joseph Hooker's arrangement given in Vol. V (Append. I. B.) of Trimen's "Flora of Ceylon." As this synopsis is intended to serve as a key to the Orders represented in this local Flora, I have omitted many special characters belonging to genera which are not likely to be met with within the area. A few of the more important exceptional characters will be found under the different classes, divisions, sub-divisions and natural orders in which they occur.

The following tabulated list of the larger and more important groups of Flowering Plants is given so as to bring into focus the general plan of the classification of the Natural Orders:—

CLASS I. **DICOTYLEDONS.**

DIVISION I. **Polypetalæ.**

SUB-DIVISION 1. **Thalamifloræ.**
(Orders Ranunculaceæ—Tiliaceæ.)

SUB-DIVISION 2. **Discifloræ.**
(Orders Lineæ—Moringeæ.)

SUB-DIVISION 3. **Calycifloræ.**
(Orders Leguminosæ—Cornaceæ.)

DIVISION II. **Gampetalæ**
(Orders Rubiaceæ—Plantagineæ.)

DIVISION III. **Monochlamydeæ.**
(Orders Nyctaginaceæ—Ceratophyllaceæ.)

CLASS II. **GYMNOSPERMS.** (Order Coniferæ.)

CLASS III. **MONOCOTYLEDONS.**

DIVISION I. **Petaloideæ.**
(Orders Hydrocharideæ—Naiadaceæ.)

DIVISION II. **Glumiferæ.**
(Orders Eriocauloneæ—Gramineæ.)

Class I. DICOTYLEDONS.

Herbs, shrubs or trees. *Stem*, when perennial, with pith surrounded by concentric layers of wood and a separable bark, increasing in girth by additional exogenous layers of wood and endogenous layers of bark. *Leaves* net-veined, usually disarticulating. Whorls of *perianth* 4- or 5-merous. *Ovules* inclosed in an ovary. *Embryo* with 2 cotyledons; radicle elongating to form the primary root.

Exceptions. Trimerous flowers occur in Anonaceæ, Menispermaceæ, Berberideæ and in a few other orders. Cotyledons not developed in *Cuscuta* (Convolvulaceæ).

Division I. **Polypetalæ.** *Flowers* with both calyx and corolla. *Petals* free.

Exceptions. Flowers wanting either calyx or corolla occur in:—Ranunculaceæ, Menispermaceæ, Cruciferæ, Bixineæ, Caryophylleæ, Sterculiaceæ, Rutaceæ, Olacineæ, Rhamneæ, Sapindaceæ, Anacardiaceæ, Combretaceæ, Lythraceæ, Samydaceæ, Ficoideæ.—Flowers with petals more or less connate at the base occur in:—Anonaceæ, Menispermaceæ, Ternstrœmiaceæ, Malvaceæ, Ilicineæ, Crassulaceæ, Myrtaceæ, Cucurbitaceæ. See also the exceptional *Gamopetalæ* and *Monochlamydeæ*.

Sub-division 1. **Thalamifloræ.** *Flowers* mostly regular and 2-sexual. *Calyx* infer. (½ infer. in *Portulaca*), of distinct or connate sepals. *Petals* distinct or united at the very base only, hypogynous. *Torus* rarely expanded into a disk. *Stamens* hypogynous. *Ovary* superior (immersed in the torus in *Nymphæaceæ*).

* *Ovary apocarpous (apparently syncarpous in* Dillenia *and* Nymphæa). *Flowers regular, 2-sexual except in* Menispermaceæ.

I. Ranunculaceæ. *Sep.* deciduous, often petaloid. *Pet.* sometimes wanting. *Stam.* indef.—Herbs with altern. leaves, or climbing shrubs. (*Clematis*) with opp. leaves; stip. 0 or adnate to petioles.

II. Dilleniaceæ (Dillenia). *Sep.* herbaceous, persistent. *Stam.* indef., in many series. *Seeds* usually arillate, but not in *Dillenia*. Trees with altern. simple leaves, stip. 0.

III. Anonaceæ. *Flowers* usually 3-merous. *Sep.* valvate, in one series. *Pet.* usually in 2 series, fleshy. *Stam.* usually many. *Carpels* usually many, subconnate in *Anona*. *Embryo* small, in ruminated endosperm. Trees or shrubs, with altern. simple entire leaves; stip. 0.

IV. Menispermaceæ. *Flowers* dicecious or polygam., small, usually 3-merous. *Pet.* shorter than sep., 6, rarely 0. Male fl.:—*Stam.* 6, in 2 series, opp. the pet. Fem. fl.:—*Staminodes* usually 6 or 0, rarely 9. *Carpels* usually 3; *style* lateral or basal. Climbing shrubs with exstip. altern. leaves.

V. Berberideæ (Berberis). *Sep.* and *pet.* 6, similar, imbricate, caducous. *Stam.* 8, opp. pet.; anther-cells opening by ascending valves. *Car-*

pet 1, few-ovuled. *Fruit* fleshy. Shrubs with yellow wood. Leaves spiny-toothed, imparipinnate, or 1-foliolate and fascicled in the axils of stipular spines.

VI. NYMPHÆACEÆ. *Sep.* 4-5. *Pet.* and *stam.* many. *Carpels* many, in pits of the torus or confluent with it. *Ovary* 1-or more-ovuled. *Fruit* a spongy berry, or of nuts sunk in pits of the turbinate torus.—Aquatic herbs, leaves usually peltate.

** *Ovary syncarpous, 1-celled, or 2-celled in* Polygaleæ ; *placentas parietal, sometimes meeting to form a 2-or more-celled fruit.*

VII. PAPAVERACEÆ. *Flowers* reg. or irreg. *Sep.* 2 or 3, caducous. *Pet.* twice the sep. *Stam.* indef., free, or (in *Fumaria*) 6 and diadelph. *Ovary* 1-celled ; ovules 2 or more, on parietal placentas. *Fruit* a capsule, or an indehiscent 1-seeded nut.—Herbs with milky or coloured juice (except in *Fumaria*). Leaves altern., exstip.

VIII. CRUCIFERÆ. *Sep.* 4, imbricate. *Pet.* 4, rarely 0. *Stam.* 6, the 4 inner longest (tetradynamous). *Ovary* usually 2-celled by a membrance from the placenta, or 1-celled. *Fruit* a 2-valved pod, rarely indehiscent or transversely septate.—Herbs with altern. exstipulate leaves.

IX. CAPPARIDEÆ. *Sep.* 4. *Pet.* usually 4, rarely 0. *Stam.* 4-many, at the base or on the sides of an elongated torus. *Ovary* sessile or stalked, 1-celled ; ovules many, on 2-5 parietal placentas. *Fruit* capsular or a berry. *Endosperm* 0.—Trees, shrubs or herbs, with altern. simple or compound leaves ; stip. spinescent in *Capparis*.

X. RESEDACEÆ (Oligomeris).—*Cal.* 4-part. *Stam.* 3-8. *Ovary* 1-celled, of 4 connate carpels, 4-lobed and open at the top. *Fruit* a capsule. *Seeds* many, without endosperm.—Herbs with linear fascicled leaves.

XI. VIOLACEÆ. *Flowers* reg. or irreg. *Sepals* 5, imbricate, persistent. *Pet.* and *stam.* 5 ; connective of 2 anthers appendaged. *Disk* annular in *Alsodeia*. *Ovary* 1-celled, with 3 parietal placentas. *Capsule* 3-valved.—Herbs or shrubs, with altern., usually stip. leaves.

XII. BIXINEÆ. *Flowers* 1- or 2-sexual. *Sep.* usually 4-5. *Pet.* 4-5 or 0, imbricate or contorted in bud. *Stam.* many, free, inserted on a disk-like receptacle. *Ovary* 1-celled, or apparently 2-8-celled. *Fruit* capsular or a berry. *Endosperm* oily.—Trees or shrubs, with alt. simple leaves ; stip. minute or 0.

XIII. PITOSPOREÆ (Pittosporum). *Flowers* reg. *Sep.* and *pet.* 5. *Stam.* 5, free. *Ovary* 1-celled, or incompletely 2-3-celled. *Capsule* 2-valved. *Endosp.* copious.—Shrubs with altern. simple exstip. leaves.

XIV. POLYGALEÆ (Polygala). *Flowers* irreg. *Sep.* 5, unequal, the 2 inner petaloid. *Pet.* 5 or 3, connate below with the fil. *Stam.* 8, 1-adelph. ; anthers opening by pores. *Ovary* 2-celled, with 1 pendulous ovule in each cell. *Fruit* a 2-celled, 2-seeded capsule opening loculicidally. *Seeds* usually strophiolate.—Usually herbs with altern. simple exstip. leaves.

*** *Ovary syncarpous, 1-celled ; ovules on a free central or basal placenta.*

XV. CARYOPHYLLEÆ. *Flowers* reg. *Sep.* 4-5, free or connate. *Pet.* 4-5. *Stam.* usually twice the pet., rarely fewer. *Styles* 2-5. *Capsule*,

2-6-valved. *Embryo* curved round mealy endosperm.—Herbs with opp. simple leaves ; stip. scarious or 0.

XVI. PORTULACEÆ (Portulaca). *Flowers* reg. *Sep.* 2, connate below, the free portion deciduous. *Pet.* 4-6, perigynous. *Stam.* 4-many, perigynous. *Ovary* ½ infer. *Capsule* dehiscing transversely. *Embryo* curved round mealy endosperm.—Herbs. Leaves altern. or opp., often with hairy stipular appendages.

XVII. TAMARISCINEÆ (Tamarix). *Flowers* reg. *Sep.* and *pet.* 5, rarely 4, free or connate below. *Stam.* 4, 5, 8 or 10. *Ovary* 1-celled, ovules many, on 3 basal placentas. *Capsule* 3-valved. *Seeds* comose.—Shrubs or trees, with minute altern. simple exstip. leaves.

****(*Ovary syncarpous* (*apocarpous in some* Malvaceæ), *1-many-celled ; placentas axile or basal.*

XVIII. ELATINEÆ (Bergia). *Flowers* reg., minute. *Sep.* and *pet.* usually 5, distinct, imbricate. *Stam.* 3, 5 or 10. *Ovary* 3-5-celled ; cells many-ovuled ; placentas axile. *Capsule* septicidally 3-5-valved.—Annuals or undershrubs.

XIX. TERNSTRŒMIACEÆ. *Flowers* reg., 2-sexual or dicœcious. *Sep.* 5, distinct. *Pet.* 5, free or connate at the base. *Stam.* usually many, often adnate to base of deciduous corolla. *Ovary* 3-5-celled ; ovules 2-many in each cell, axile.—Trees or shrubs, with altern. simple exstip. leaves.

XX. DIPTEROCARPEÆ (Shorea). *Flowers* reg., 2-sexual. *Sep.* 5, connate, persist. *Stam.* many ; fil. short, connective subulate. *Ovary* 3-celled ; cells 2-ovuled. *Fruit* inclosed in the enlarged 5-winged cal.—Resinous trees, with altern. simple coriaceous stipulate leaves.

XXI. MALVACEÆ. *Flowers* reg., usually 2-sexual. *Sep.* 5, valvate, free or connate. *Pet.* 5, imbricate, twisted. *Stam.* usually many, 1-adelph., the tube adnate to base of pet. ; anth. 1-celled. *Ovary* 2-many-celled ; ovules 1 or more in each cell, axile. *Fruit* of distinct carpels or capsular. *Embryo* curved.—Trees, shrubs or herbs. Leaves altern. simple or rarely compound, stipulate.

XXII. STERCULIACEÆ. *Flowers* 2-or 1-sexual, usually regular. *Sep.* 5, more or less connate, valvate. *Pet.* 5, connate below or 0. *Stam.* 5-20 ; fil. more or less connate, anth. 2-celled. *Carpels* 2-5 (1 in *Waltheria*). *Fruit* of follicles, or a loculicidal capsule.—Herbs, shrubs or trees. Leaves altern., simple or compound, stipulate.

XXIII. TILIACEÆ. *Flowers* mostly 2-sexual and reg. *Sep.* 5 or 4, free or connate. *Pet.* 5 or 4, distinct *Stam.* usually many, distinct ; anthers 2-celled. *Ovary* usually 2-5-celled ; style simple ; ovules 2-many in each cell. *Fruit* a capsule or drupe. *Endosp.* fleshy.—Herbs, shrubs or trees. Leaves usually altern., stipulate.

SUB-DIVISION 2. **Disciflorœ.** *Sep.* distinct or connate, rarely super. to ovary. *Pet.* distinct, or connate at the very base. *Torus* generally expanded into a pulvinate or cupular disk between the pet. and ovary, rarely of glands or 0.

Exceptions. Disk obscure in *Malpighiaceæ*, or lining the cal. in *Rhamneæ* and *Anacardiaceæ* ; not present in *Ilex*, *Coriaria* and in some *Lineæ*

and *Geraniaceæ*. Cal. super. in *Gouania*, *Helinus*, and more or less adnate to ovary in other genera of *Rhamneæ*. Pet. in *Coriaria* become fleshy and inclose the ripe carpels.

* *Ovules pendulous, raphe ventral.*

XXIV. LINEÆ. *Flowers* reg. and 2-sexual. *Sep.* usually 5, free or connate below, imbricate. *Pet.* 5, imbr., often contorted. *Stam.* usually with interposed staminodes; fil. more or less connate. *Disk* of glands, or obscure. *Ovary* 3-5-celled; cells 1-2-ovuled; styles 3 or 5. *Fruit* a capsule or drupe. *Endosp.* scanty.—Usually herbs or shrubs, with altern. simple leaves.

XXV. MALPIGHIACEÆ. *Flowers* reg. or irreg., 2-sexual. *Cal.* 5-part. One of the segments with a large gland outside (in *Hiptage*). *Pet.* 5, imbr. *Disk* obscure. *Stam.* 10. *Ovary* 3-celled, with 1 ovule in each cell. *Fruit* of 1-3 winged nuts. *Seeds* without endosp.—Trees or shrubs, often climbing. Leaves opp. stip., minute or 0.

XXVI. ZYGOPHYLLEÆ. *Flowers* reg., 2-sexual. *Sep.* and *pet.* 4-5, distinct, imbr. *Stam.* 10 or more (12—15 in *Peganum*), inserted at the base of the lobed disk. *Ovary* 4-5-lobed or-winged; cells 2-many ovuled. *Fruit* dehiscent or not.—Herbs or shrubs. Leaves opp. (altern. in *Peganum*), compound, stipulate, not gland-dotted.

XXVII. GERANIACEÆ. *Flowers* reg. or irreg., 2-sexual. *Sep.* free, usually 5, equal or unequal, one of them sometimes spurred or saccate. *Pet.* 5 (very unequal in *Impatiens* and *Hydrocera*). *Stam.* 5-15. *Disk* of 5 glands or 0. *Ovary* 5-celled; cells few-or many-ovuled. *Fruit* of five 1-seeded cocci, or a capsule, or (in *Hydrocera*) a drupe.—Herbs or shrubs, rarely trees, with altern. or opp., simple or compound, usually 2-stipulate leaves.

XXVIII. RUTACEÆ. *Flowers* 2-or 1-sexual. *Sep.* 4-5, imbr. *Pet.* 4-5, distinct, imbr. or valvate. *Disk* large or small. *Stam.* usually def. (many in *Citrus* and *Ægle*). *Carpels* 4-5, free or connate; ovules 1—2 or many in each cell. *Fruit* various.—Usually trees or shrubs. Leaves simple or compound, exstip., pellucid-punctate.

XXIX. SIMARUBEÆ. *Flowers* usually reg., 1-or 2-sexual, *Sep.* 5. *Pet.* 5, imbr. or valvate. *Stam.* 10, distinct, inserted at base of disk. *Ovary* free, lobed or entire, 1-5-celled, cells 1-ovuled. *Fruit* of 1-5 one-seeded indehiscent winged carpels, or a 1-seeded drupe.—Trees or shrubs, with altern. stip. usually pinnate leaves.

XXX. OCHNACEÆ. (Ochna). *Flowers* reg., 2-sexual, conspicuous. Sep. 5, imbr., persist. *Pet.* 5-10, imbr. *Stam.* many. *Disk* tumid. *Ovary* 3-10-lobed; ovules solitary in each cell. *Fruit* of 3-10 sessile drupes.—Glabrous trees or shrubs, with altern. simple stip. shining, coriaceous leaves.

XXXI. BURSERACEÆ. *Flowers* reg., 2-sexual or polygamous. *Cal.* lobes 5 or 4. *Pet.* 5 or 4, valvate or imbr. *Stam.* 8-10. *Disk* annular, cup-shaped or lining the cal.-tube. *Ovary* 2-5-celled; ovules 2 in each cell. *Fruit* a drupe, containing 1-5 nuts (in *Boswellia* finally separating). *Seeds* without endosp.—Resinous trees or shrubs, with altern. compound exstip. leaves.

XXXII. MELIACEÆ. *Flowers* reg., 1-or 2-sexual. *Cal.* 3-6-lobed. *Pet.* 3-6, usually imbr. *Stam.* 4-12, 1-adelph. except in *Cedrela* and *Chloroxylon*:

Disk annular (O in *Amoora*). *Ovary* 2-5-celled; cells 1-2-many-ovuled, style simple. *Fruit* a capsule or drupe.—Usually trees with altern. compound exstip. leaves.

** *Ovules pendulous, raphe dorsal.*

XXXIII. OLACINEÆ. *Flowers* reg., usually 2-sexual. *Cal.* cup-shaped, minute (obsolete in *Cansjera*). *Pet.* 3-6, valvate. *Disk* cup-shaped. Fertile stam. 3 or 4-5. *Ovary* 1-5-celled; ovules 1-3 in each cell, pendulous. *Drupe* 1-celled, 1-seeded. *Endosp.* copious.—Usually trees or shrubs, with altern. simple exstip. leaves.

XXXIV. ILICINEÆ (Ilex). *Flowers* dicœcious. *Cal.* 4-lobed, imbr. *Pet.* 4, connate at base. *Stam* 4-5, adnate to base of corolla. *Disk* 0. *Ovary* 2-or more-celled; stigma large, sessile; ovules 1-2 in each cell, pendulous. *Fruit* a drupe, with 2 or more 1-seeded stones. *Endosp.* fleshy.—Usually trees with altern. simple exstip. evergreen leaves.

*** *Ovules erect, raphe ventral.*

XXXV. CELASTRINEÆ. *Flowers* reg., 2-sexual or polygamous. *Cal.* 4-5-lobed, persistent. *Pet.* 4-5, imbr. or valvate. *Stam.* 3-5. *Ovary* free or immersed in the large disk, 2-5-celled, with 2-or more erect ovules in each cell. *Fruit* dehiscent or not.—Trees or shrubs, with simple usually coriaceous leaves; stip. deciduous or 0.

XXXVI. RHAMNEÆ. *Flowers* 2-sexual, rarely polygamous. *Cal.* 4-5-lobed (super. in *Gouania* and *Helinus*), lobes valvate. *Pet.* small, 4-5 or 0. *Disk* lining the cal.-tube, often with a free margin. *Stam.* 4-5, opp. pet. *Ovary* 2-4-celled, with 1 erect ovule in each cell. *Fruit* indehiscent (except in *Helinus*).—Trees or shrubs, often climbing. Leaves altern., simple, stip.

XXXVII. AMPELIDEÆ. *Flowers* rarely 1-sexual. *Cal.* cup-shaped, entire or obscurely lobed. *Pet.* 4-5, distinct or connate, valvate. *Disk* large, cupular or annular. *Stam.* 4-5, opp. to pet., free, or connate and adnate to pet. *Ovary* 2-celled, cells 2-ovuled, or 6-celled and with 1 ovule in each cell. *Fruit* a berry.—Shrubs or herbs, usually climbing. Leaves altern., stip., simple or compound.

**** *Ovules ascending, or pendulous from an erect funicle, raphe ventral, or reversed.*

XXXVIII. SAPINDACEÆ. *Flowers* often irreg. and usually polygam. *Sep.* 4-5, distinct and imbr., or connate into a 4-6-lobed valvate cal. *Pet.* 4-5, distinct (wanting in *Schleichera* and *Dodonœa*). *Disk* annular or unilateral. *Stam.* 5-10, fil. distinct. *Ovary* 1-6-celled; ovules 1 or 2 in each cell. *Fruit* capsular or indehiscent, sometimes winged.—Trees, shrubs or herbs. Leaves usually altern. (opp. in *Acer*), simple or compound, exstip.

XXXIX. SABIACEÆ. *Flowers* often irreg., usually 2-sexual. Cal.-lobes 4-5, imbr. *Pet.* 4-5, often unequal. *Disk* small, annular or cupular, 3-5-toothed. *Stam.* 5 (only 2 fertile in *Meliosma*). *Ovary* usually 2-celled, with 2 superposed ovules in each cell. *Fruit* a 1-celled 1-seeded drupe, or

of 2 dry indehiscent carpels. *Endosp.* 0.—Trees or climbing shrubs, with altern. exstip. simple or compound leaves.

XL. ANACARDIACEÆ. *Flowers* 1-or 2-sexual. *Cal.* 3-5-part. *Pet.* free, 3-5, rarely 0. *Disk* annular. *Ovary* of 5 distinct 1-ovuled carpels, or carpels combined into a 2-5-celled ovary. *Drupe* with a 1-celled, 1-seeded stone (2-5-celled in *Spondias*). *Embryo* large, endosp. 0.—Trees or shrubs, with altern. simple or compound exstip. leaves.

The two following natural orders are of doubtful affinity:—

XLI. CORIARIEÆ. (Coriaria). *Flowers* small, reg., 2-sexual. *Sep.* 5 imbr., persistent. *Pet.* 5, keeled within. *Stam.* 10, free, or the altern. ones adnate to pet., anth. exserted. *Disk* 0. *Carpels* 5, distinct, 1-celled, whorled on a fleshy receptacle; ovules 1 in each cell, pendulous. *Fruit* of 5 distinct 1-celled 1-seeded nuts embraced by the enlarged fleshy pet. —Glabrous shrubs with 4-angular branches. Leaves usually opp. and exstip.

XLII. MORINGEÆ. (Moringa). *Flowers* large., irreg., 2-sexual, *Cal.* 5-cleft, segments unequal, petaloid, deciduous from above the base, imbr. *Pet.* 5, unequal. *Stam.* on edge of disk, declinate; fertile 5 and opp. pet.; anth. 1-celled. *Ovary* stalked, 1-celled; ovules many, in 2 series, on 3 parietal placentas. *Capsule* elongate, 1-celled, loculicidally 3-valved. *Seeds* many, endosp. 0.—Trees with bi-or tripinnate leaves; stip. gland-like.

SUB-DIVISION 3. **Calycifloræ.** *Flowers* reg., or irreg., 1-or 2-sexual. *Cal.* super. or infer. *Pet.* distinct or united at the base perigynous. *Disk* rarely present. *Stam.* perigynous or epigynous.

Exceptions. Stam. obscurely perigynous in *Leguminosæ*, epipetalous in *Kalanchœ* (*Crassulaceæ*).

**Ovary super., of 1 or more free or connate carpels; infer. in some* Rosaceæ *also in* Vahlia (Saxifragaceæ). *Styles usually as many as the carpels.*

XLIII. LEGUMINOSÆ. *Flowers* usually irreg. and 2-sexual. *Cal.-lobes* usually connate, often 2-lipped. Pet. 5 or fewer, rarely 0 or connate. usually very unequal (papilionaceous). *Stam.* normally 10, diadelph. or monadelph, and declinate, or many, rarely all distinct. *Ovary* free, 1-celled; ovules 1 or more, on the ventral suture. *Fruit* a dehiscent or indehiscent 1-many-seeded pod. *Cotyledons* large; endosp. usually 0.—Trees, shrubs or herbs, often climbing. Leaves altern., usually compound stipulate.

XLIV. ROSACEÆ. *Flowers* reg. and 2-sexual, rarely polygam. *Pet.* 5. *Stam.* many, distinct. *Ovary* of 1 or more free or connate carpels; ovules 1 or 2 in each carp. *Fruit* various. *Endosp.* 0.—Herbs, shrubs or trees. Leaves altern., simple or compound, stipulate.

XLV. SAXIFRAGACEÆ. *Flowers* reg., 2-sexual. *Cal.* more or less adnate to ovary, lobes 5. *Pet* 5. *Disk* epigynous. *Ovary* 1-or 2-celled (superior in *Vahlia*), styles 1 or 2, ovules many, parietal or axile. *Fruit* a capsule. *Seeds* many.—Herbs or shrubs, with opp. altern. exstip. leaves.

XLVI. CRASSULACEÆ (Kalanchoe). *Flowers* reg. and 2-sexual. *Cal.* 4-lobed. *Cor.-tube* inflated; lobes 4, spreading. *Stam.* 8, in 2 series, on the corolla-tube. Glands of *disk* 4, hypog. *Carpels* 4, adnate to base of cor.-tube; ovules many. Fruit of 4 many-seeded follicles.—Herb with opp. fleshy exstip. leaves.

** *Ovary infer., or included in cal.-tube, syncarpous; style undivided; cells 2-or more-ovuled.*

XLVII. RHIZOPHOREÆ (Carallia). *Flowers* reg., 2-sexual. *Cal.* super; lobes 4–8. *Pet.* as many as cal.-lobes, margin dentate. *Stam.* twice as many as pet., inserted with them outside an annular crenulated disk. *Ovary* 4-celled, with 2 pendulous ovules in each cell. *Fruit* indehiscent, 1-seeded.—*C. integerrima* is an evergreen tree with opp. stipulate shining coriaceous leaves.

XLVIII. COMBRETACEÆ. *Flowers* reg., 1-or 2-sexual. *Cal.* super., limb tubular; lobes 4—5, valvate. *Pet.* 4, 5 or 0. *Stam.* 8 or 10. *Ovary* 1-celled; ovules 2—5, pendulous. *Fruit* indehiscent, 1-seeded. *Cotyledons* large, endosp. 0.—Trees or shrubs, with simple exstip. leaves.

XLIX. MYRTACEÆ. *Flowers* reg., 2-sexual. *Cal.* super.; limb short, 4—5-lobed. *Pet.* 4 or 5, free or united in a cap. *Stam.* many, epigynous. *Ovary* 2—4-celled, cells many-ovuled, style simple. *Fruit* indehiscent, 1-many-seeded; endosp. 0.—Trees or shrubs, with simple usually gland-dotted leaves; stip. small or 0.

L. MELASTOMACEÆ. *Flowers* reg., 2-sexual. *Cal.* super.; limb tubular 3—5-lobed. *Pet.* 3–5, contorted in bud. *Stam.* 3, 8, or 10, on the cal.-tube; anth. opening by pores at the summit, connective, often appendaged. *Ovary* 3—5-celled, cells many-ovuled, style simple. *Fruit* a many-seeded capsule.—Herbs with opp. exstip. leaves.

LI. LYTHRACEÆ. *Flowers* 2-sexual. *Cal.* infer. (super. in *Punica*); lobes 3—6, rarely more, valvate, persistent. *Pet.* as many as cal.-lobes, rarely 0, crumpled. *Stam.* def. or many, inserted on cal.-tube. *Ovary* 1—6-celled or (in *Punica*) many-celled; ovules usually many, style simple. *Capsule* many-seeded. *Endosp.* 0.—Trees, shrubs or herbs, with opp. entire exstip. leaves.

LII. ONAGRACEÆ. *Flowers* reg., 2-sexual. *Cal.* super. or ½ super.; lobes 3–6, valvate. *Pet.* 3–6, rarely 0. *Stam.* as many as or twice the number of pet., epigynous. *Ovary* 2—5-celled; ovules usually many (solitary in each cell in *Trapa*). *Fruit* a many-seeded capsule (indehiscent and 1-seeded in *Trapa*).—Herbs, often aquatic, or undershrubs. Leaves altern., stipulate in *Trapa*.

*** *Ovary infer., or super., syncarpous, 1-celled or 3-celled by fusion of placentas; styles distinct, or connate below.*

LIII. SAMYDACEÆ (Cascaria). *Flowers* reg. *Cal.* infer., 4—5-lobed. *Pet.* 0. *Stam.* 8, connate, with alternating staminodes, hypogynous. *Ovary* 1-celled; ovules many, parietal, stigma 3-fid. *Capsule* soft, loculicidally 3-valved. *Seeds* arillate, endospermous.—Shrubs or small trees, with altern. simple leaves; stip. minute, deciduous.

LIV. CUCURBITACEÆ. *Flowers* reg., 1-sexual. MALE :—*Cal.-tube* short, 5-lobed. *Pet.* 5, usually connate. *Stam.* 3, rarely 5, on the cal.-tube ; anth. free or connate, cells usually conduplicate. FEM.:—*Cal.-tube* wholly adnate to ovary (except in *Actinostemma*), limb. 5-fid. *Staminodes* 3 or 5. *Ovary* 1-celled ; placentas 3, fleshy, often meeting in the centre, stigmas 3, ovules usually many. *Fruit* fleshy, rarely dehiscent.—Herbs with spiral tendrils. Leaves altern., simple, lobed or compound.

LV. BEGONIACEÆ (Begonia). *Flowers* monœcious. *Male perianth* of 2 outer valvate opp. sepaloid segments, and of 2 inner smaller segments or 0. *Stam.* many, usually 1-adelph. *Fem. perianth* of 2—5 segments. *Ovary* infer., 3-celled ; ovules many, on axile placentas ; style-branches 3. *Fruit* a 3-gonous capsule, winged at the angles. *Seeds* many, minute.—Succulent herbs with altern. stip. leaves.

LVI. FICOIDEÆ. *Flowers* reg., usually 2-sexual. *Sep.* 5, infer. *Pet.* 0. *Stam.* perig. or hypog. *Ovary* 2—5-celled, or of 5 free 1-ovuled carpels. *Fruit* a capsule, or of 5 free indehiscent carpels. *Seeds* reniform ; embryo curved round mealy endosp.—Herbs with simple opp. or whorled leaves.

LVII. UMBELLIFERÆ. *Flowers* in umbels, usually reg., 2-sexual or polygam. *Cal.* super.; limb 5-fid. or 0. *Pet.* 5, often inflexed, free, valvate or imbr. *Stam.* 5, epig. *Ovary* 2-celled, crowned with a large epig. disk ; cells with 1 pendulous ovule, styles 2. *Fruit* of 2 indehiscent carpels, pendulous from the summit of the carpophore, each 5-ridged, and often traversed by oil-canals.—Herbs with altern. simple or compound exstip. leaves ; petioles usually dilated at base.

LVIII. ARALIACEÆ. *Flowers* reg., 1-or 2-sexual. *Cal.* super., limb small or 0. *Pet.* 5—6, valv. *Stam.* as many as pet., epig. *Ovary* 2-or more-celled, crowned with a disk ; ovules solitary and pendulous in each cell, styles as many as the cells, distinct or united. *Fruit* a drupe or berry, with 1 or more 1-seeded cells. *Endosp.* fleshy.—Trees or shrubs, often climbing. Leaves altern., simple or compound ; stip. adnate to petioles or 0.

LIX. CORNACEÆ. *Flowers* reg., 2-sexual. *Cal.* super ; limb 4—10-fid. *Pet.* 4—10, valvate. *Stam* 4—8 or more, epig. *Disk* epig. *Ovary* 1-celled or 2—3-celled at the base, style simple ; ovule 1, pendulous. *Fruit* a berry or drupe. *Endosp.* fleshy.—Trees or shrubs, with altern. leaves ; stip. 0.

DIVISION II.—**Gamopetalæ.** *Flowers* usually 2-sexual, reg. or irreg. *Cal.* super. or infer. *Pet.* connate, forming an entire or cleft corolla, rarely free to a little above the base. *Stam.* inserted on cor., rarely hypog. or epig.

Exceptions. Limb of cal. obsolete in some RUBIACEÆ, and in many of the COMPOSITÆ.—Flowers with free pet. occur in : CANPANULACEÆ, MYRSINEÆ, EBENACEÆ and OLEACEÆ.—Cor.-lobes in 2 series in *Mimusops* (SAPOTACEÆ). Cor. scarious in PLANTAGINEÆ.—Stam. indef. in *Symplocos* (STYRACEÆ), and in some EBENACEÆ.—Stam. free and hypog. in *Plumbago* and *Vogelia* (PLUMBAGINEÆ).—In ASCLEPIADACEÆ the pollen adheres in masses (pollinia) as in the *Orchideæ*.

1. *Flowers* reg. or irreg. *Cal.* usually super. *Stam.* as many as the cor.-lobes, rarely fewer, epipet. or epig.

LX. RUBIACEÆ. *Flowers* usually reg. and 2-sexual. *Cal.* super., limb usually 4- 5-cleft. *Corolla* tubular to rotate, usually 4–5-lobed. *Stam.* as many as cor.-lobes, inserted on the tube altern. to lobes. *Ovary* 2-or more-celled, rarely 1-celled ; ovules 1 or more in each cell ; style simple. *Disk* epig. *Fruit* a berry drupe or capsule, or of distinct cocci, 2-many-seeded. *Endosp.* horny.- Herbs, shrubs or trees. Leaves opp., with interpetiolar stip., or (in Tribe GALIEÆ) whorled and exstip.

LXI. COMPOSITÆ. *Flowers*, reg. or irreg., 1-or 2-sexual, arranged in a head on a common receptacle and surrounded by an involucre of bracts, all tubular (head discoid), or the outer or all ligulate (flowers rayed). *Cal.* super.; limb of hairs (*pappus*), or scales, or 0. *Cor.* of ray-flowers with the lobes connate in a strap, of disk flowers with 4 or 5 valvate spreading lobes. *Stam.* on the cor.-tube, fil. free, anth. connate (in *Xanthium* the fil. are connate and anth. free). *Ovary* 1-celled ; ovule 1, erect. *Disk* epig. *Fruit* an achene with or without pappus.—Herbs or shrubs, rarely trees. Leaves mostly altern.; stip. 0.

LXII. CAMPANULACEÆ. *Flowers* reg. or not, 2-sexual. *Cal.* super. or ½ super. (*Sphenoclea*), limb 5-part. *Cor.* 5-lobed, or 2-lipped and dorsally cleft to base, lobes valvate. *Stam.* 5, epig. or (in *Sphenoclea*) on base of cor.-tube ; anth. distinct or connate. *Ovary* 2—3-celled, many-ovuled ; stigmas 2—3-lobed. *Capsule* many-seeded.—Herbs with altern. exstip. leaves.

2. *Flowers* reg., rarely 1-sexual. *Cal.* infer., rarely ½ infer. *Stam.* hypog., perig., epig. or epipet., as many as or twice the number of cor.-lobes, or indef. *Ovary* 1-or more-celled.

LXIII. PLUMBAGINEÆ. *Cal.* infer., tubular, 5-part., persist. *Cor.* persist., tube long ; lobes 5, only slightly connate at base, twisted in bud. *Stam.* 5, opp. pet., hypog. *Ovary* 1-celled, ovule pendulous from a basal funicle, style simple, stigmas 5. *Capsule* circumsciss. at base.—Herbs or small shrubs with altern. stip. leaves.

LXIV. PRIMULACEÆ. *Cal.* infer. (½ infer. in *Samolus*), 5-cleft, persist. *Cor.* hypog. (perig. in *Samolus*); lobes 5, imbr. *Stam.* 5, on cor.-tube and opp. the lobes. *Ovary* 1-celled ; ovules many, on a free central placenta. Capsule 5-valved or circumsciss.—Herbs with opp. or altern. leaves, stip. 0.

LXV. MYRSINEÆ. *Flowers* often 1-sexual. *Cal.* infer. or ½ infer., persist. *Cor.* 4–5-part. *Stam.* epipet., as many as cor.-lobes and opp. to them. *Ovary* 1-celled ; ovules few or many, on a free central placenta, style simple. *Fruit* a berry, 1-or more-seeded, endospermous.—Trees or shrubs, with altern. simple exstip. leaves.

LXVI. SAPOTACEÆ. *Cal.* infer., persist., 6–8-part. *Cor.-lobes* 5—14, or 15—24 in 2 series. *Stam.* 5 8, altern. with staminodes, or many and without staminodes. *Ovary* about 6–8-celled, with 1 ovule in each cell. *Berry*, 1—6-seeded. *Seeds* large, shining.—Trees with altern. entire exstip. leaves.

LXVII. EBENACEÆ. (Diospyros). *Flowers* 1-sexual. *Cal.* infer., 4–5-lobed, accrescent. *Cor.* tubular or urceolate, lobes twisted. MALE

FL. :—*Stam.* 4 to many (usually about 16), on base of cor., or on the torus. FEM. FL. :—*Staminodes* 2-10. *Ovary* 3-or more-celled, with 1, rarely 2 ovules in each cell. *Fruit* indehiscent, 1-10-seeded. *Seeds* large, endosp. copious.—Trees or shrubs, with altern. or opp. entire exstip. leaves.

LXVIII. STYRACEÆ. (Symplocos). *Flowers* 2-sexual. *Cal.* super.; limb small, 5-lobed, imbr. *Pet.* 5, free or slightly connate at base, imbr. *Stam.* many and in several series, at the base of the cor. *Ovary* 2—3-celled; ovules 2, pendulous in each cell, style simple. *Drupe* 1-3-seeded. *Endosp.* copious.—Trees or shrubs with altern. exstip. leaves.

3. *Ovary* super., rarely infer. *Stam.* as many as and altern. with cor.-lobes, or fewer. *Carpels* 2, rarely 1 or 3.

* *Flowers reg. Leaves usually opposite.*

LXIX. OLEACEÆ. *Flowers* usually 1-sexual. *Cal.* infer., 4-9-lobed. *Cor.-lobes* 4-5 or more. *Stam.* 2, on base of cor. *Ovary* 2-celled, cells 1-2-ovuled (3-4 in *Schrebera*), style simple, often 2-lobed. *Fruit* a capsule berry or drupe. *Seeds* 1-2 in each cell.—Trees or shrubs. Leaves opp., rarely altern.; simple or pinnate, stipules 0.

LXX. SALVADORACEÆ (Salvadora). *Flowers* 1-or 2-sexual. *Cal.* infer., 4-part., lobes imbr. *Stam.* 4, epipet. *Ovary* 1-celled, with a solitary erect ovule. *Fruit* a 1-seeded drupe. *Endosp.* 0.—Trees or shrubs, with opp. entire exstip. leaves.

LXXI. APOCYNACEÆ. Flowers 2-sexual. *Cal.* infer., 5-part., often with scales or glands within. *Corolla* salver-shaped or rotate; lobes 5, contorted. *Stam.* 5, inserted on cor.-tube, free or adnate to the stigma, pollen granular. *Disk* various or 0. *Carp.* 2, distinct, 1-or 2-celled, few-or many-ovuled, style 1, stigma 2-fid. *Fruit* a berry or drupe, or of 2 distinct or connate follicles. *Seeds* often comose at one or both ends.—Trees, shrubs or herbs, with usually milky juice. Leaves opp. or whorled, entire, exstip.

LXXII. ASCLEPIADACEÆ. *Cal.* infer.; lobes 5, imbr. *Cor.-tube* with often a ring of scales in the throat; lobes 5, valvate or contorted. *Stam.* 5, on base of cor., fil. usually connate in a fleshy tube; anth. adnate by a broad connective to the stigma, 2-celled; pollen in 1 or 2 erect or pendulous granular masses in each cell, the masses of contiguous cells of different anthers attached to glands at the angles of the stigma. *Carp.* 2, distinct, inclosed in the stam.-tube, many-ovuled; styles 2; stigma 1, adnate to the anth. *Follicles* 2. Seeds many, crowned with a long pencil of hairs, endosp. copious.—Herbs or shrubs, usually twining. Leaves opp., exstip., entire, rarely 0.

LXXIII. LOGANIACEÆ. *Cal.* infer., segments 4 or 5. *Cor.-lobes* 4 or 5, valvate or imbr. *Stam.* 4 or 5, on the cor.-tube, fil. distinct. *Ovary* 2-celled, ovules many in each cell. *Fruit* indehiscent or a capsule. *Seeds* 1, 2 or many, endosp. copious.—Trees, shrubs or herbs, with opp. leaves.

LXXIV. GENTIANACEÆ. *Cal.* infer., 4-5-part. *Cor.* rotate tubular campanulate or ventricose; lobes 4-5, contorted, rarely valvate. *Stam.* on tube or throat of cor., and as many as the lobes, fil. distinct. *Ovary* 1-celled, with parietal placentas, rarely 2-celled, many-ovuled;

style simple, stigmas 2. *Fruit* a many-seeded capsule.—Herbs with opp. exstip. leaves

** *Flowers reg. Leaves usually altern.*

LXXV. HYDROPHYLLACEÆ (Hydrolea). *Cal.* infer., 5-part. *Cor.* rotate, 5-cleft, lobes imbr. *Stam.* 5, on cor.-tube, fil. distinct. *Ovary* 2-celled, cells many-ovuled, styles 2. *Capsule* septicidally 2-valved, many-seeded. *Seeds* minute.—Herbs with altern. exstip. leaves. Flowers racemose.

LXXVI. BORAGINEÆ. *Flowers* rarely 1-sexual. *Cal.* infer., 4-8 (usually 5)-cleft, persist. *Cor.* tubular, funnel-shaped or rotate; lobes usually 5, imbr. *Stam.* on cor.-tube, as many as the cor.-lobes and altern. with them, fil. distinct. *Ovary* 2-celled and with 2-ovules in each cell, or 4-celled and with 1 ovule in each cell, styles 1 or 2. *Fruit* a drupe or of 2-4 nutlets.—Trees, shrubs or herbs. Leaves rarely opp., stip. 0. Inflor. corymbose, usually of scorpioid cymes.

LXXVII. CONVOLVULACEÆ. *Cal.* infer., persist., 5-part., or of 5 imbr. sep. *Cor.* campan. or funnel-shaped; lobes 5, plaited or contorted in bud. *Stam.* 5, on the cor.-tube, fil. free. *Ovary* often surrounded by an annular disk, 2-celled with 2 ovules in each cell, or 4-celled and with 1 ovule in each cell, styles simple or 2-fid., stigmas 2. *Fruit* dry or fleshy, indehiscent or 2-4-valved or circumsciss., 1-4-seeded; endosp. 0; cotyl. plaited (0 in *Cuscuta*).—Herbs or shrubs, often twining. Leaves altern. (0 in *Cuscuta*). Flowers usually cymose.

LXXVIII. SOLANACEÆ. *Cal.* infer., often persist. and enlarged, 5-cleft. *Cor.* campan. funnel-shaped or rotate; lobes 5, plaited or valvate in bud. *Stam.* 5, on cor-tube; anth-cells sometimes opening by pores. *Ovary* 2-celled or imperfectly 4-celled, style and stigmas simple; ovules many, on large placentas. *Fruit* a berry or capsule, many-seeded. *Embryo* curved round fleshy endosp.—Herbs or shrubs with altern. simple or binate leaves; stip. 0. Flowers in axillary or terminal cymes.

*** *Flowers irreg. or oblique. Cal. infer. Dorsal stam. often imperfect or 0. Ovary-cells usually many-ovuled.*

LXXIX. SCROPHULARIACEÆ. *Cal.* infer., 5-lobed or-part. *Cor.* 4-5-lobed, usually 2-lipped, lobes imbr. *Stam.* 4, didynamous, rarely 2 or 5. *Ovary* 2-celled, styles simple, stigmas 2. *Capsule* 2-valved, usually many-seeded. *Seeds* small, endosp. fleshy.—Herbs. Leaves opp. or whorled or the upper rarely altern.; stip. 0. Flowers in racemes or spikes.

LXXX. OROBANCHACEÆ. *Cal.* 5-part. or spathulate. *Cor.-tube* funnel-shaped, lobes 5, imbr., the 2 opp. exterior. *Stam.* 4, didynamous, anth. cohering in pairs, 1-or 2-celled. *Ovary* 1-celled; ovules many, on 2 or 4 parietal placentas. *Capsule* 2-valved, many-seeded.—Herbaceous scapigerous root-parasites. Leaves 0. Fl. racemose.

LXXXI. LENTIBULARIACEÆ. (Utricularia). *Cal.* 2-part. *Cor.* 2-lipped, spurred. *Stam.* 2, on base of cor.; anth. confluent. *Ovary* 1-celled; ovules many, on a free central placenta, style short, stigma 2-lobed. *Capsule* 2-4-valved.—Annual marsh or aquatic herbs. Leaves whorled or altern.

LXXXII. GESNERACEÆ. *Cal.* 5-lobed, valvate. *Cor.* often 2-lipped; lobes 5, imbr. *Stam.* 2-5, often only 2 perf.; anth. more or less confluent. *Ovary* 1-celled; ovules many, on 2 parietal placentas. *Caps.* 2-4-valved, many-seeded.—Herbs with altern. opp. or whorled leaves; stip. 0.

LXXXIII. BIGNONIACEÆ. *Cal.* campan. or spathulate. *Cor.* campan- or tubular, 5-lobed. *Stam.* 4, didynamous, or 5. *Disk* cushion-like or annular. *Ovary* 2-celled by confluence of placentas; ovules many. *Caps.* elongate, 2-celled and 2-valved, septum thick. *Seeds* large, winged, endosp. 0.—Trees with opp. compound leaves. Fl. in racemes or panicles.

LXXXIV. PEDALIACEÆ. *Cal.* 5-part. *Cor.* ventricose, sub-2-lipped; lobes 5, imbr. in bud. *Stam.* 4, didynamous, or 5. *Ovary* 1-celled, or 2-4-celled by confluence of pariet. placentas; ovules 2 or more, superposed, stigmas 2. *Fruit* dehiscent (beaked with spines in *Martynia*).—Herbs with opp. or altern. leaves. Fl. axillary, large.

LXXXV. ACANTHACEÆ. *Cal.* 4-5-part., or (in *Thunbergia*) many-part. *Cor.* 2-lipped, or upper lip wanting; lobes imbr. or contorted. *Stam.* 4 or 2; anth. 2-or 1-celled. *Ovary* 2-celled; ovules 1 or more, superposed in each cell, style usually bifid. *Caps.* loculicidal. *Seeds* usually compressed and often hairy.—Herbs or shrubs, with opp. simple exstip. leaves. Inflor. various; fl. often with conspicuous bracts.

**** *Flowers mostly irreg. and 2-lipped. Cal. infer. Ovary-cells 1-ovuled or ovules 2 and collateral. Fruit indehiscent.*

LXXXVI. VERBENACEÆ. *Flowers* reg. or not. *Cal.* 2-or 4-6-part, 2-lipped or not, persist. *Cor.* 4-6-lobed, 2-lipped or not. *Stam.* 4, didynamous, rarely more or 2. *Disk* present. *Ovary* 2-4-celled (1-celled in *Verbena*), cells. 1 2-ovuled. *Fruit* usually a drupe, rarely capsular. —Herbs shrubs or trees, with opp. or ternate simple or compound leaves; stip. 0. Fl. in heads, spikes or racemes.

LXXXVII. LABIATÆ. *Flowers* irreg. *Cal.* 5 rarely 6-10-cleft, persist. *Cor.* 2-lipped or upper lip 0, rarely nearly reg., 4-5-lobed,) *Stam.* 4, didynamous; anth. 1 or 2-celled. *Disk* present. *Ovary* 4-lobed, or of two 2-celled carp.; ovules solitary and erect in each cell; style slender, usually bifid. *Fruit* of 4 small indehiscent nutlets.—Herbs or undershrubs, usually aromatic. Stem usually 4-gonous. Leaves opp. or whorled, stip 0. Fl. in cymes or fascicles or whorled.

An order of doubtful affinity.

LXXXVII. PLANTAGINEÆ. (Plantago). *Fl.* reg. *Cal.* infer.; sepals 4, imbr., persist. *Cor.* scarious, tubular; lobes 4, imbr. *Stam.* 4, on cor.-tube; fil. long, flexuous. *Ovary* 2-celled, with many ovules in each cell. *Caps.* circumsciss. *Seeds* peltate.—Scapigerous perennial herbs. Leaves radical. Fl. in spikes.

DIVISION III. **Monochlamydeæ.** *Perianth* single, rarely 0. Lobes or segments 1-seriate, or if 2-seriate both usually calycine.

Exceptions:—Cor. present in *Loranthus* and in a few of the EUPHORBIACEÆ.—In the genus *Euphorbia* several male-fl. surrounding a single fem.-fl. are inclosed within a common involucre.—In

Ficus the minute 1-sexual fl. are attached to the inner walls of a hollow fleshy receptacle.

1. Ovary 1-celled and 1-ovuled (in Amarantaceæ often 2-or more-ovuled). Embryo annular curved or folded; endosp. mealy or 0.

LXXXIX. NYCTAGINACEÆ (Boerhaavia).—*Fl.* 2-sexual. *Perianth* infer., 5-lobed, coloured, imbr., plaited in bud, tube persist. *Stam.* 1-5, hypog, exserted. *Ovule* erect, style slender. *Fruit* membranous. *Cotyl.* large, folded round the endosp.—Herbs with opp. leaves; stip. 0. Fl. panicled, umbelled or capitate.

XC. AMARANTACEÆ. *Flowers* 1-2-sexual. *Sep.* infer., 5, scarious or herbaceous, imbr., persist. *Stam.* 1-5, opp. sep.; fil. distinct, or connate with the interposed staminodes. *Ovary* 1-ovuled (2 or more in *Deeringia* and *Celosia*), ovules basal. *Fruit* usually an indehiscent utricle, rarely a berry. *Seeds* erect.—Herbs or shrubs with opp. or altern. exstip. leaves.

XCI. CHENOPODIACEÆ.—*Flowers* 1-or 2-sexual. *Perianth* infer.; segments 3-5, or in fem.-fl. often 0, distinct or connate, imbr., persist. *Stam.* usually 5, opp. perianth-lobes, hypog. or perig. *Ovary* 1-celled, 1-ovuled, stigmas 2-5. *Fruit* a membranous utricle. *Seed* horiz. or vert.; endosp. mealy, or scanty or 0.—Herbs or undershrubs. Leaves usually altern. Fl. small, axillary.

XCII. POLYGONACEÆ.—*Fl.* 2-sexual. *Perianth* infer., 4-6-cleft, often coloured, imbr., persist. *Stam.* 4-8, perigynous. *Styles* 2 or 3. *Ovule* basal. *Fruit* a 3-gonous or biconvex nutlet. *Embryo* lateral, endosp. floury.—Herbs with altern. leaves, and sheathing stip. Fl. axillary, in heads spikes or cymes, bracteate.

2. Ovary 4-6-celled, many-ovuled. Embryo minute in fleshy endosp.

XCIII. ARISTOLOCHIACEÆ. (Aristolochia). *Flowers* 2-sexual, irreg. *Perianth* super., inflated at base. *Stam.* 6, sessile round the very short style. *Caps.* 6-valved. *Seeds* 3-gonous.—Herbs or shrubs, with altern. exstip. leaves. Fl. axillary.

3. Ovary super., 1-celled and 1-ovuled, or of 3-4 partially connate carpels.

XCIV. PIPERACEÆ. *Flowers* 2-sexual or dioecious. *Perianth* 0 (involucre petaloid in *Houttuynia*). *Stam.* 1-6, hypog.; anth.-cells distinct or confluent. *Styles* 2-6, ovule erect. *Fruit* globose or subglobose, dry or succulent (dehiscent in *Houttuynia*). *Embryo* minute, endosp. hard.—Herbs or shrubs, often climbing. Leaves altern. opp. or whorled. Fl. minute, in spikes.

4. Ovary super., 1-celled and 1-ovuled. Stam. on perianth-tube. Seeds with distinct testa.

XCV. LAURACEÆ.—*Flowers* 1-sexual (2-sexual in *Cassytha*). *Perianth.* infer., usually 6-cleft or-part., often persist. *Stam.* usually 9, in 3 rows, with sometimes a 4th inner row of staminodes; fil. flattened, 2-gland., at the base; anth. usually 4-celled (2-celled in *Cassytha*), opening by valves. *Ovule* pend. Fruit indeh. *Endosp.* 0.—Trees or shrubs (*Cassytha* is a leafless climber). Leaves altern., or whorled, rarely opp., entire, stip. 0. Fl. usually in panicles.

XCVI. ELÆAGNACEÆ (Elæagnus). *Flowers* 2-rarely 1-sexual. *Perianth* infer., covered with silvery scales, tube narrow; limb globose, of 4 triangular valvate segments. *Stam.* 4, on mouth of perianth. *Ovule* basal, erect, style long, stigma lateral. *Fruit* indeh., inclosed in the thickened base of perianth-tube. *Cotyl.* thick, endosp. 0. Lepidote shrubs, with altern. entire exstip. leaves. Fl. axillary.

5. Ovary infer., 1-4-ovuled; ovules without apparent coats. Seeds adnate to walls o pericarp.

XCVII. LORANTHACEÆ.—*Flowers* 1-or 2-sexual. *Cal.* super., limb truncate or 0. *Pet.* 3-5, usually long, distinct or connate, valvate. *Stam.* 3-5, opp. and attached to pet. *Ovary* 1-celled; ovule 1, erect, adnate to wall of ovary. *Fruit* a 1-seeded berry. *Seed* adnate to pericarp; embryo straight in fleshy endosp.—Tree parasites, often with articulate branches. Leaves opp. or altern. or 0; stipules 0.

XCVIII. SANTALACEÆ (Osyris). *Flowers* small, polygam. *Cal.* super.; segments of limb 3-4, with a tuft of hairs on the face, valvate. *Stam.* 3, opp. perianth segments. *Ovary* 1-celled; ovules 2 or 3, on a free central placenta, pendulous. *Fruit* indeh. *Embryo* axile in copious endosp.—Shrubs with altern. entire exstip. leaves. Fl. axillary.

6. Fl. 1-rarely 2-sexual Ovary of 1 carp. or syncarpous; cells 1-2-ovuled, ovules, if 2 collateral, styles as many as the carpels.

XCIX. EUPHORBIACEÆ. *Perianth* infer., single, rarely double or 0. *Disk* often present. *Stam.* 1, or more. *Ovary* 2-3-celled, cells 1-2-ovuled, ovules pendulous. *Fruit* of 2-3 loculicidal cocci, or a drupe or berry. *Endosp.* fleshy.—Herbs, shrubs or trees, often with milky juice. Leaves altern., simple, rarely opp. or compound, usually stip.

C. URTICACEÆ. *Perianth* infer., lobed or part. *Stam.* as many as and opp. perianth segments or fewer, fil. erect or incurved in bud. *Ovary* 1-2-celled, cells 1-ovuled; style simple or bifid, or stigma sessile. *Fruit* a samara, drupe or achene, or a syncarp of confluent pericarps and perianths. *Seed* erect or pendulous, endosp. scanty or 0.—Herbs, shrubs or trees, often with milky juice. Leaves often oblique, rarely opp. or compound, stipulate. Inflor. various; fl. small or minute, often sunk in a fleshy disk or inclosed in a fleshy receptacle. Male-fl. of *Morus* in catkins.

7. Flowers monœcious; male-fl. in pendulous catkins; fem.-fl. solitary, or in short erect clusters. Ovary infer.

CI. JUGLANDACEÆ (Engelhardtia). MALE-FL.:—*Perianth* of 3-6 scales, adnate to a 3-lobed stipitate bract. *Stam.* 4-12, on the perianth. *Fem.-fl.* solitary and sessile on a 3-lobed bract, stigmas 2. *Fruit* a small globose nut, endocarp 2-valved.—Trees or shrubs, with altern. pinnate exstip. leaves.

CII. CUPULIFERÆ (Quercus).—*Male-fl.* on pendulous catkins. *Perianth* campan., 4-6-lobed. *Stam.* 3-many. *Fem.-fl.* on short erect spikes, each fl. inclosed within an involucre of bracts. *Perianth* tubular adnate to ovary. *Ovary* 3-or 4-5-celled, with 2 ovules in each cell, styles 3-5. *Fruit* a 1-celled nut seated in a cup formed of the hardened imbr. bracts.—Trees with altern. coriaceous leaves, stip. early deciduous.

8. Flowers dioecious, both male and fem.-fl. in catkins, Perianth 0. Ovary super.

CIII. SALICACEÆ (Salix). *Flowers* solitary in the axils of bracts. *Perianth* 0. *Disk* of 1 or 2 glands. *Stam.* 2 or more. *Ovary* 1-celled, style short or 0, ovules few to many. *Fruit* a 2-valved caps. *Seeds* many, with a tuft of long silky hairs from the funicle.—Trees or shrubs, with altern. stip. leaves.

Order of doubtful affinity.

CIV. CERATOPHYLLACEÆ. *Flowers* monœcious; MALE:—*Sep.* 6-12, narrow, bifid, subvalvate in bud. *Stam.* 10-20; anth. oblong, exstrorse, connective bicuspidate. FEM.-FL.:—*Sep.* of male. *Ovary* ovoid, 1-celled; style subulate, persist.; ovule 1, pendulous. *Fruit* a compressed coriaceous achene, spinous on margin. *Cotyl.* thick.—Submerged aquatic herbs, with slender much-branched fragile stems. Leaves whorled, cleft into filiform toothed segments.

CLASS II. GYMNOSPERMS.

Trees or shrubs, usually resinous. *Stem* with pith surrounded by concentric layers of wood and bark and increasing in girth as in *Dicotyledons*. *Leaves* usually needle-shaped. *Fl.* 1-sexual. *Perianth* usually 0. *Ovules* not inclosed in an ovary, but attached to the scales (open carpels), or to the axis of a cone. *Seeds* endospermous, cotyledons 2-many.

CV. CONIFERÆ (Pinus). *Flowers* monœcious. *Male-fl.* in spikes; anth. in many series, 2-celled, connective produced. *Fem. cones* with spirally twisted bracts, the ovule-bearing scale larger than the bracts. *Ovules* 2, at the base of the scale and reflexed. *Ripe cone* ovoid or oblong, scales persist. *Seeds* 2, reversed, usually winged.—Evergreen trees with whorled branches. Leaves linear, in clusters of 2, 3 or 5, from the axils of membranous scales.

CLASS III. MONOCOTYLEDONS.

Herbs, rarely shrubs or trees. *Stems* with isolated vascular bundles traversing the cellular tissue. *Leaves* usually paralled-veined. Whorls of *perianth* 3-merous. *Ovules* inclosed in an ovary. *Embryo* with 1 cotyl.: radicle not elongating to form a tap-root, but emitting secondary roots from its crown.

Exceptions.—Net-veined leaves occur in *Dioscorea*, *Smilax*, also in AROIDEÆ and in a few other orders.—The flowers are often 4-merous in NAIADACEÆ, and are occasionally 2-merous in GRAMINEÆ.

DIVISION I. **Petaloideæ.** *Perianth* usually of **6** free or connate segments in 2 series, the inner or both series more or less coloured and petal-like.

Exceptions.—*Flowers* wanting the per. occur in HYDROCHARIDEÆ, TYPHACEÆ, ARACEÆ, LEMNACEÆ and NAIADACEÆ.

SUB-DIVISION 1. **Microspermous.** *Flowers* 1-or 2-sexual. *Per.* super.; segments usually 2-seriate, inner or both corolline. *Ovary* 1-celled, or placentas parietal. *Seeds* many, minute.

CVI. HYDROCHARIDEÆ. *Flowers* 1-sexual, inclosed in spathes. *Sep.* 3. *Pet.* 3 or 0. *Stam.* 3-15, anth. erect. *Ovary* 1-or almost 3-celled; styles or stigmas 3-12. *Fruit* fleshy or membranous.—Aquatic herbs with undivided leaves.

CVII. ORCHIDEÆ. *Flowers* irreg., 2-sexual. *Perianth* 6-part; segments in 2 series, inner or both corolline. *Stam.* usually 1, confluent with the style in a column; anth. 2-celled, pollen-grains cohering in waxy or powdery masses. *Ovary* 1-celled, with 3 parietal placentas, usually twisted. *Caps.* loculicidal.—Herbs or shrubs, often epiphytic.

SUB-DIVISION 2. **Epigynous.** *Flowers* 2-sexual (except *Dioscoreaceæ*). *Perianth* super., in 2 series, one or both corolline. *Ovary* 1-3-celled. *Endosp.* copious.

CVIII. SCITAMINEÆ. *Flowers* irreg., 2-sexual. *Per.* 2-seriate, inner or both petaloid, limb spreading. *Stam.* only 1 fertile. *Ovary* 1-3-celled, style long, stigma often ciliate round the margin. Perennial herbs with penninerved leaves. Inflor. usually spicate. (In *Musa* the fl. 2-sexual the inner perianth is represented by 1 short pet., and there are 5 fertile stam.)

CIX. AMARYLLIDEÆ. *Perianth* super., petaloid; limb 6-lobed (r-part., in 2 series. *Stam* 6, on base of per. segments, fil. distinct or connate, anth. erect or versatile. *Ovary* 3-celled, cells many-ovuled. *Fruit* indehiscent, or a capsule opening loculicidally or bursting irregularly. Rootstock bulbous or tuberous. Leaves linear or lanceolate. Scape few or many-flowered.

CX. DIOSCOREACEÆ (Dioscorea). *Flowers* 1 sexual. *Perianth* 6-cleft, in 2 rows. MALE-FL.:—*Stam.* 6, or 3 only perf., on base of per.-segments, anth. oblong or globose. FEM.-FL.:—*Staminodes* 3 or 6. *Ovary* 3-gonous, 3-celled, cells 2-ovuled, stigmas 3. *Fruit* a coriaceous 3-winged loculicidal capsule, dehiscing through the wings. Seeds flat, broadly winged.—Twining herbs or shrubs, sometimes prickly. Leaves opp. or altern., simple or 3-5-fol. Inflor. spicate or racemed.

SUB-DIVISION 3. **Coronariæ.** *Flowers* rarely 1-sexual (diœcious in *Smilax*). *Perianth* infer., 6-part., in 2 series, one or both corolline. *Ovary* super., 3-celled.

CXI. LILIACEÆ. *Flowers* 2-sexual. *Perianth* petaloid 6-merous, segments free or connate below. *Stam.* 6, on the per., or hypog., fil. usually free. *Ovary* 3-celled, cells 2-or more-ovuled. *Fruit* a 3-celled berry or capsule. *Seeds* subglobose or flattened; endosp. horny or fleshy, embryo terete.—Herbs, rarely shrubs.

CXII. PONTEDERIACEÆ (Monochoria). *Flowers* 2-sexual, irreg. *Sep.* 3, oblong. *Pet.* large, corolline, obovate, marcescent. *Stam.* 6, on base of

segments, one longest with fil., laterally toothed. *Ovary* 3-celled, cells many-ovuled, style slender. *Caps.* membranous, loculicidally 3-valved. *Seeds* small, endosp. floury, embryo cylindric.—Aquatic herbs, erect, creeping or floating. Leaves often with tumid spongy petioles. Scape erect, from the leaf-sheaths. Fl. in spikes or racemes, blue.

CXIII. COMMELINACEÆ. *Flowers* more or less irreg., 2-sexual. *Perianth* 6-part., in 2 series, marcescent. *Stam.* 6, at the base of the per.-segments, all or 3 only perf., fil. often bearded. *Ovary* 3-celled, cells, 1-few-ovuled, style often bearded and enlarged below the tip. *Caps.* loculicidal. *Endosp.* floury, embryo minute.—Herbs or undershrubs with altern. leaves sheathing at their bases. Fl. in cymes or panicles.

SUB-DIVISION 4. **Calycinæ.** *Perianth* infer., lobes or segments 2-seriate, inner series rarely corolline. *Ovary* super., 1-3-celled. *Endosp.* copious.

CXIV. JUNCACEÆ (Juncus). *Perianth* infer., 6-part., in 2 series, persist., segments narrow. *Stam.* 6 or 3, on bases of per.-segments; anth. erect, basifixed. *Ovary* 1-or 3-celled, many-ovuled, stigmas 3. *Caps.* 1-3-celled, loculicidally 3-valved. *Seeds* many, erect, endosp. hard, embryo small. Annual or perennial herbs with terete or compressed sheathing leaves, or the leaves often reduced to sheaths. Fl. in axillary or term. cymes.

CXV. PALMÆ. *Flowers* mostly 1-sexual. *Perianth* infer., 6-part. or-lobed, in 2 series. *Stam.* usually 6, on base of per., anth. versatile. *Ovary* 1-3-celled, or of three distinct or connate carp., cells 1-2-ovuled.—Shrubs or trees, armed or not. Stem erect, scandent or decumbent. Leaves altern., variously compound. Inflor. various, at first inclosed in a woody or coriaceous spathe. Fl. usually small, green or yellowish.

SUB-DIVISION 5. NUDIFLORÆ. *Perianth* 0, or of scales or bristles. *Ovary* super., 1-2-celled. *Endosp.* usually present.

* *Inflor. inclosed in a (sometimes imperfect) spathe.*

CXVI TYPHACEÆ. *Flowers* monœcious, minute, densely crowded in globose or cylindric 1-sexual bracteate spikes. MALE-FL.:—*Stam.* 1 or more, fil. capillary, anth. basifixed, erect, 2-celled. FEM.-FL.:—*Ovary* 1-2-celled, 1-ovuled (often imperfect in *Typha*). Fruit small membranous or drupaceous (laterally dehiscent in *Typha*). *Endosp.* floury or bony, embryo cylindric.—Aquatic or marsh perennial herbs. Leaves linear, erect or floating.

CXVII. ARACEÆ. *Flowers* small, 1-sexual (2-sexual in *Acorus*), usually on a 2-sexual spadix, with the fem.-fl. below. *Perianth* 0, (of 6 orbicular sep. in *Acorus*). MALE-FL.:—*Anth.* 2-4-celled, free or connate. FEM.-FL.:—*Ovary* sessile, 1-3-celled; cells 1-or more-ovuled. *Fruit* a 1-or few-seeded berry. *Embryo* small, in copious endosp., or macropodous and without endosp.—Terrestrial or aquatic herbs with radical leaves, or suffruticose climbers. Leaves various. Spathe herbaceous, convolute.

** *Fl. solitary or binate, sunk in the sides or surface of small or minute floating lenticular or globose fronds.*

CXVIII. LEMNACEÆ. *Flowers* monœcious, few, most minute, in fissures of the frond, naked or in a sheath. *Perianth* 0. MALE-FL.:—*Stam.* 1 or 2, anth. 1-or 2-celled. FEM.-FL.:—*Ovary* 1-celled, style short, stigma truncate or funnel-shaped; ovules 1 or more. *Fruit* a membranous utricle. *Seeds* ribbed, endosp. 0, embryo cylindric.—Small or minute, gregarious, floating, scale-like, green plants.

SUB-DIVISION 6. **Apocarpous.** *Perianth* 1-2-seriate or 0. *Ovary* super., of 1 or more distinct 1-or more-ovuled carpels. *Endosp.* 0.

CXIX. ALISMACEÆ. *Flowers* 1-or 2-sexual. *Perianth* infer., 6-part., in 2 series. *Sep.* 3, herbaceous, persist. *Pet.* 3, involute in bud, decid. *Stam.* 6-9 or more, hypog. or perig. *Ovary* of few or many distinct carp.; ovules 1 (or many in *Butomopsis*). *Fruit* of small achenes or follicles. *Endosp.* 0, embryo hooked.—Annual or perennial marsh or aquatic plants. Leaves radical, entire. Fl. whorled or umbelled.

CXX. NAIADACEÆ. Fl. 1-or 2-sexual, often inconspicuous, naked or in a sheath. *Perianth* infer., tubular or of 1 or more segments, or 0. *Stam.* 1-4, or 6, hypog.; anth. 1-2-celled. *Ovary* of 1-4 one-ovuled free carp. *Fruit* apocarp. *Endosp.* 0. Embryo macropodous.—Aquatic herbs.

DIVISION II. **Glumiferæ.** *Flowers* in the imbricating bracts of heads or spikelets, 1-or 2-sexual. *Perianth* 0, or of minute scales or bristles, rarely with sheathing bracteoles (2-seriate in *Eriocaulonceæ*). *Ovary* super., 1-celled and 1-ovuled, or in *Eriocauloneæ*, of three 1-ovuled cells. *Endosp.* copious.

CXXI. ERIOCAULONEÆ. *Flowers* minute, in involucrate heads, 1-sexual *Perianth* usually of 6 membranous sep. in 2 series. *Stam.* 6 or fewer *Ovary* super., 3-lobed, 3-celled. *Fruit* a membranous loculicidally 3-valved capsule.—Scapigerous herbs with narrow leaves.

CXXII. CYPERACEÆ. *Flowers* in spikelets of imbr. bracts (glumes). 1-or 2-sexual. *Per.* 0, or of hypog.-scales or bristles. *Stam.* 1-3, anth. basifixed. *Ovary* super. (included in an utricle in *Careæ*), style 1, stigmas 2-3 ovule erect. *Fruit* indeh. *Embryo* in base of copious endosp.—Grass-like herbs with terete or 3-angled stems. Leaves narrow, sheaths entire.

CXXIII. GRAMINEÆ.—*Flowers* in spikelets of imbr. bracts (glumes) 1-or 2-sexual. *Per.* of 2 or more minute hypog.-scales (*lodicules*), or 0. *Stam.* 3, rarely 1, 2 or more, anth. versatile. *Ovary* super.; styles 2, rarely 1, distinct or united below, stigmas pennicillate or feathery, ovule erect. *Fruit* indeh. *Seed* usually adherent to the membranous or coriaceous pericarp; embryo towards the base and side of copious endosp.—Grasses, mostly herbs (shrubby or arborescent in *Bambuseæ*). Stem terete or compressed. Leaves usually narrow; sheath split to the base, distinct from the blade and with a membrane or ridge of hairs (*ligule*) at the junction.

Flora of the Upper Gangetic Plain,

and of the adjacent

Siwalik and Sub-Himalayan tracts.

I.—RANUNCULACEÆ.

ANNUAL or perennial herbs, rarely shrubs. *Leaves* radical or alternate (opposite in *Clematis*). *Stipules* 0, or adnate to the petiole, rarely free. *Flowers* regular or irregular, 1- or 2-sexual, rarely bracteate. *Sepals* 5 or more, rarely 2-4, usually deciduous, often petaloid, imbricate (valvate in *Clematis*). *Petals* 0, or 3-5 or more, imbricate, often minute or deformed. *Anthers* usually adnate and dehiscing laterally. *Carpels* usually many, free, 1-celled; stigma simple; ovules 1 or more, on the ventral suture. *Fruit* of numerous 1-seeded achenes, or many-seeded follicles, rarely a berry. *Seeds* small, albuminous.

The majority of the Indian species of this rather large family are confined to the Himalayan ranges, and belong to genera which are represented in European gardens by many familiar ornamental plants, such as:—*Anemone, Columbine, Larkspur, Monkshood, Pœony,* etc. Nearly all the species possess a more or less acrid juice, and some of them are extremely poisonous. Nigella sativa, *L.*, Vern. *Kálajira*, is occasionally found in native gardens, its seeds being used both as a condiment and medicinally.

Climbing shrubs with opposite leaves, sepals petal-like, valvate, petals 0 . . . . 1. CLEMATIS.

Herbs with alternate leaves, sepals imbricate.

Sepals petal-like, petals 0 . . . . . 2. THALICTRUM.

Sepals herbaceous, petals 5 . . . . . 3. RANUNCULUS.

1. CLEMATIS, Linn.; Fl. Br. Ind. i. 2.

Usually woody climbers. *Leaves* opposite, usually compound, exstipulate, petioles often twining. *Inflorescence* axillary or terminal. *Sepals* usually 4, petaloid, valvate. *Petals* 0. *Stamens* many. *Carpels* many, each with 1 pendulous ovule. *Fruit* a head of sessile or stalked achenes, each with usually a long feathery style.

Sepals spreading from the base, fil. glabrous . . 1. *C. Gouriana.*

Sepals erect with recurved tips, fil. hairy . . 2. *C. nutans.*

1. **C. Gouriana,** *Roxb. Fl. Ind. ii. 670; W. & A. Prod 2; Royle Ill. 51; Hk. f. & T. Fl. Ind. 8; F. B. I. i. 4; Watt E. D.* Vern. *Belkun* (Dehra Dun).

An extensive climber, usually glabrous; young parts pubescent. *Leaves* pinnate, 2-pinnate or 2-ternate; *leaflets* membranous, ovate-oblong or cordate, acuminate, shining above, sometimes pubescent beneath. *Flowers* small, in dense panicles, yellowish or greenish-white. *Sepals* spreading from the base, obovate or oblong, puberulous. *Filaments* glabrous. *Achenes* narrowly oblong, hairy.

Dehra Dun. DISTRIB.: Punjab Hills and West Himalaya up to 5,000 ft., extending to Ceylon, the Malay Peninsula, Java and the Philippines. This species, though very variable in regard to its foliage, closely resembles the European *C. Vitalba*, the well-known "Traveller's Joy." The specific name given by Roxburgh refers to *Gour*, the ancient capital of Bengal, amongst the ruins of which this plant is abundant. It begins to flower towards the end of the rainy season.

2. **C. nutans,** *Royle Ill. 51; Hk. f. & T. Fl. Ind. 10; F. B. I. i. 5.* Vern. *Nákchhikni* (Dehra Dun).

A slender silkily pubescent woody climber with furrowed stems. *Leaves* decompoundly pinnate; *leaflets* 1-3 in., ovate oblong or lanceolate, acutely or obtusely 3-5-lobed, rarely entire. *Flowers* large, in much-branched panicles, pale yellow. *Sepals* erect, with recurved tips, oblong, many-nerved, silky outside. *Filaments* hairy towards the base. *Achenes* large, ovate, silky.

Dehra Dun, in shady ravines. DISTRIB.: West Himalaya, from the Sutlej to Kumaon, up to 5,000 ft.; Parasnáth in Behár; Chota Nagpur; Khasia Hills. The flowers appear at the beginning of the cold season.

2. THALICTRUM, Linn.; Fl. Br. Ind. i. 10.

Erect, usually rigid, perennial herbs. *Leaves* compound; *petioles* sheathing, often auricled or stipuled. *Flowers* in panicles or racemes, often polygamous. *Sepals* 4-5, imbricate, petaloid. *Petals* 0. *Stamens* many. *Carpels* few or many; ovule 1, pendulous. *Fruit* a small head of sessile or stalked achenes.

Leaves ternately decompound, anthers not pointed 1. *T. javanicum.*

Leaves pinnately decompound, anthers pointed . 2. *T. foliolosum.*

1. **T. javanicum,** *Blume Bijdr. 2; F. B. I. i. 13.* T. glyphocarpum, *W. & A. Prod. 2; Hk. f. & T. Fl. Ind. 16.*

Stems 2-3 ft., erect, glabrous. *Leaves* ternately divided, with auricled sheaths; *leaflets* ½-¾ in. long, orbicular or oval, obtusely 3-7-toothed at the apex, base rounded or cordate, glaucous beneath; *stipules* adnate to the petioles, membranous, fimbriate. *Flowers* small, white, often clustered at the ends of the panicle branches. *Filaments* club-shaped; *anthers*

not pointed. *Achenes* large, oblong, with a short hooked beak, strongly ribbed.

Dehra Dun. DISTRIB: West Himalaya, from Simla to Sikkim, up to 2,000 ft.; Khasia Hills; Parasnáth in Behár; Chota Nagpur, and south to Ceylon and Java.

2. **T. follolosum,** *D C. Syst. i. 175; Royle Ill. 51; Hk. f. & T. Fl. Ind. 16; F. B. I. i. 14; Watt E. D.* Vern. *Shuprak.*

Stems 4-8 ft. high, glabrous. *Leaves* pinnately decompound, with auricled sheaths; *leaflets* orbicular, without stipels. *Flowers* in much-branched panicles, polygamous, white, pale green or dingy purple. *Anthers* pointed. *Achenes* acute at each end, sharply ribbed.

Dehra Dun. DISTRIB.: Abundant throughout the Temperate Himalaya up to 9,000 ft., also on the Khasia Hills. The root, *mamira,* is much valued as a native remedy for ophthalmia, and also as a febrifuge.

3. RANUNCULUS, Linn.; Fl. Br. Ind. i. 16.

Annual or perennial herbs. *Leaves* entire lobed or dissected. *Stipules* membranous or 0. *Flowers* usually panicled, white or yellow. *Sepals* 3-5, herbaceous, caducous, imbricate in bud. *Petals* usually 5, rarely 0, often glandular near the base. *Stamens* many. *Carpels* many, styles short; ovule 1, ascending. *Fruit* a head or spike of beaked or apiculate achenes. To this genus belong the common English Buttercups (*R. bulbosus, acris,* and *repens*).

An aquatic plant with white flowers . .	1. *R. aquatilis.*
Flowers yellow—	
Glabrous; achenes turgid, not margined	2. *R. sceleratus.*
Hairy; achenes flattened and with an intramarginal rib	3. *R. pensylvanicus.*

1. **R. aquatilis,** *Linn. Sp. Pl. 556; Var.* trichophyllus, *Chaix (sp.) F. B. I. i. 16.* R. aquatilis, L. (in part); *Don in Royle Ill. 54; Hk.f. & T. Fl. Ind. 29; Watt E. D.* (Water crow-foot.)

Leaves all submerged, segments thread-like; *stipules* ½-adnate, auricled. *Flowers* shortly peduncled, usually small, white. Stamens few. Achenes in globular heads, transversely wrinkled.

Occasionally in the Gangetic Plain as far south as Saharanpur and Delhi. DISTRIB.: Punjab Plain; West Himalaya from the Indus to Kumaon, up to considerable elevations, extending through Baluchistan and Afghanistan to Europe, where many varieties occur; also in N. Asia, and in temperate parts of the S. Hemisphere. Floating leaves never occur in the Indian plant. The acrid and unwholesome properties characteristic of *Ranunculaceæ* are not found in this species.

2. **R. sceleratus,** *Linn. Sp. Pl. 551; Royle. Ill. 53; Hk. f. & T. Fl. Ind. 35; F. B. I. . 19; Watt E. D.* R. indicus, *Roxb. Fl. Ind. ii. 671.* (Cedery-leaved crow-foot.)

An erect glabrous annual. *Stem* 1-3 ft., often stout fleshy and branched, rarely puberulous above. *Leaves* 3-lobed or -partite; lower petioled, 3-partite, with obovate cuneate segments; upper trifid, with linear segments; stipules membranous. *Flowers* rather small, yellow. *Calyx* reflexed, often woolly outside. *Petals* oblong. *Achenes* numerous, in oblong heads, turgid not margined, obliquely obovate, obtuse or very shortly mucronate. *Receptacle* oblong, pilose.

Abundant throughout the area in wet ground. DISTRIB.: Punjab and Bengal plains, and warm valleys of the Himalaya up to 5,000 ft., extending to Europe and N. Asia. The whole plant is extremely acrid, and is often used by the natives as a vesicant.

3. **R. pensylvanicus,** *Linn. f. Suppl. 272; F. B. I. i. 19.* R. fibrosus, *Wall.; Hk. f. & T. Fl. Ind. 37.* R. chinensis, *Bunge; Hk. f. & T. l. c. 38.* R. riparius, *Edgew. in Trans. Linn. Soc. XX, 28.*

An erect hairy annual. *Stem* 2-3 ft., prostrate at the base and often rooting at the nodes, patently hairy. *Leaves* 3-partite, segments deeply divided; lower on long petioles; leaflets long-stalked and deeply cut into linear segments; upper sessile or nearly so. *Flowers* about 1 in. in diam., yellow. *Sepals* reflexed. *Receptacle* pilose. Very variable in the shape of the head of achenes, and in the prominence and position of the intra-marginal rib.

In the Kheri district of N. Oudh, in wet ground; banks of the Ganges near Bhojpur (Edgeworth). DISTRIB.: Ludhiana, on the banks of the Sutlej (Edgeworth); Nepal Terai; Khasia Hills, up to 6,000 ft., extending to N. China, Amur-land, and N. America.

II.—DILLENIACEÆ.

TREES, shrubs or herbs, sometimes climbing. *Leaves* alternate, simple, entire or toothed, usually with exstipulate sheathing petioles. *Flowers* yellow or white, often showy. *Sepals* 5, imbricate, persistent. *Petals* usually 5, deciduous. *Stamens* many, in several series. *Carpel* 1 or more, free or cohering in the axis; styles distinct. *Fruit* of follicles, or indehiscent and sub-baccate. *Seeds* arillate (except in *Dillenia*); albumen fleshy. Chiefly tropical, also largely represented in Australia.

DILLENIA, Linn.; Fl. Br. Ind. i. 36.

Trees. *Leaves* broad, with conspicuous parallel lateral nerves. *Flowers* large, solitary or fascicled, yellow or white. *Sepals* 5, spreading. *Petals* 5, broad. *Stamens* nearly free; *anthers* linear, bursting by small slits or pores; inner introrse, outer extrorse. *Carpels* 5-20, cohering in the axis; ovules indefinite. *Fruit* globose,

formed of the matured indehiscent carpels inclosed in the thickened cup. *Seeds* naked or immersed in pulp; aril none.

Flowers white, appearing with the leaves, seeds hairy . . . . . 1. *D. indica.*

Flowers yellow, appearing before the leaves, seeds glabrous—

Flowers solitary . . . . . 2. *D. aurea.*

Flowers fasicled . . . . . 3. *D. pentagyna.*

1. **D. indica,** *Linn. Sp. Pl. 535; F. B. I. i. 36; Brand. For. Fl. 1.* D. speciosa, *Thunb; Roxb. Fl. Ind. ii. 650; W. & A. Prod. 5; Royle Ill. 58; Hk. f. & T. Fl. Ind. 69; D. & G. Bomb. Fl. 2. Watt E. D.* Vern. *Chaltr.*

A handsome evergreen round-headed medium-sized tree. *Leaves* oblong, lanceolate, serrate. *Flowers* large, solitary, subterminal, white, appearing with the leaves. *Sepals* fleshy. *Seeds* many, hairy.

Tropical forests at the base of the Himalaya from Nepal to Assam (possibly wild in N. Oudh); Bengal, S. India, Ceylon, Burma, Malay Peninsula and Archipelago. Cultivated in most Indian gardens in the plains. The fragrant flowers open during June and July, and the round hard apple-like fruits ripen during the cold season. The acid calyx surrounding the ripe carpels is eaten raw or cooked in curries, and is also used for making a jelly.

2. **D. aurea,** *Smith Exot. Bot. ii. 65, t. 92; Hk. f. & T. Fl. Ind. 70; Royle Ill. 58; F. B. I. i. 37; Brand. For. Fl. 2; Watt E. D.* Vern. *Aggai* (Oudh).

A small tree in Oudh, rarely over 2 ft. in girth, and 20 ft. high. *Leaves* deciduous, about 1 ft. long, oblong or obovate, tapering into the deeply channelled sheathing petioles, crenate-dentate, rufous-silky on both sides when young, glabrous above when old. *Flowers* 2-3 in. across, with ovate bracts at the base of the peduncle, large, solitary, golden yellow, terminating lateral branches, appearing before the leaves. *Sepals* fleshy, oblong, obtuse, glaucous, silky when young. *Carpels* 6-12, inclosed in the fleshy calyx. *Fruit* about the size of a small apple. *Seeds* many, glabrous, surrounded by viscid pulp.

Forests of N. Oudh. DISTRIB.: Base of Himalaya, from Nepal to Bhutan; Burma, Malay Peninsula, Andaman Islands, Java, Borneo. The new foliage appears in April, after the flowers have opened. Wood grey, beautifully mottled.

3. **D. pentagyna,** *Roxb. Cor. Pl. I, 21, t. 20; Fl. Ind. ii. 652; W. & A. Prod. 5; Hk. f. & T. Fl Ind. 71; D. & G. Bomb. Fl. 2; F. B. I. i, 38; Brand. For. Fl. 2. Watt E. D.* D. augusta and D. pilosa, *Roxb. l. c.* Vern. *Aggai.*

A moderate-sized tree. *Branches* ascending and drooping at the ends, rough and scarred when old; young parts silky. *Leaves* deciduous, 1-2 ft. long, oblong-lanceolate, denticulate, decurrent into short winged

sheathing petioles. *Flowers* 5-8, loosely fascicled on the 2-3-year-old branches, about 1 in. in diam., appearing before the leaves, yellow, sweet-scented. *Sepals* ovate, obtuse, glabrous. *Petals* oblong or obovate. *Carpels* 5. *Fruit* pendulous, about the size of a gooseberry.

Sal forests of Rohilkhand, Oudh, and Gorakhpur. DISTRIB.: Base of Himalaya from Nepal to Assam, Bengal, Central Provinces, S. India, Burma. The old leaves are shed during March and April, and the flowers appear soon afterwards; ripe fruit in May. The pleasantly acid flower-buds and young fruit are eaten raw or cooked; the ripe fruit is also eaten. The old rough leaves are much used for polishing ivory, etc.

No indigenous member of the allied family *Magnoliaceæ* is represented in the Upper Gangetic Plain, but the following well-known and extensively cultivated tree should be mentioned:—Michelia Champaca, *Linn. Sp. Pl. 536; Roxb. Fl. Ind. ii. 656; W. & A. Prod. 6; Royle Ill. 58; Hk. f. & T. Fl. Ind. 79; F. B. I. i. 42; Brand. For. Fl. 3; Watt E. D. King in Ann. R. Bot. Gard. Calc. iii, part 2, 216.* The Champak tree. Vern. *Champa.* A tall handsome evergreen tree with sweet-scented yellow flowers. It has been planted in many parts of the area, especially near temples. On the Himalaya it is found up to 5,400 feet. Believed to be indigenous in the forests of the Straits Settlements, and in Java. It flowers during the hot and rainy seasons. The beautifully mottled heartwood is much valued.

III.—ANONACEÆ.

TREES or shrubs, often climbing. *Leaves* alternate, exstipulate, simple, entire. *Flowers* usually 2-sexual. *Sepals* 3, free or connate, usually valvate. *Petals* 6, in 2 series, or the inner absent. *Stamens* usually many, closely packed on the torus; *filaments* short or 0, *anthers* adnate, connective produced into an oblong dilated or truncate head. *Ovaries* usually indefinite, apocarpous (syncarpous in *Anona*); *style* short or 0; *ovules* 1 or more. *Fruit* of 1 or more sessile or stalked 1- or many-seeded usually indehiscent carpels. *Seeds* large, with dense ruminate albumen; embryo small. Species nearly all tropical, often aromatic.

Artabotrys odoratissima, R. Br., a glabrous evergreen shrub with strongly scented yellow flowers, is cultivated in many gardens in Northern India. It is indigenous in S. India and Ceylon.

Outer petals much longer than the sepals.
- Ripe carpels distinct, 1-seeded . . . . 1. POLYALTHIA.
- Ripe carpels connate in a fleshy many-seeded fruit . . . . . 2. ANONA.

Outer petals small and like the sepals.
- Inner petals flat, ovules 1 or 2 . . . . 3. MILIUSA.
- Inner petals saccate at the base, ovules 6 or more . . . . . 4. SACCOPETALUM.

1. POLYALTHIA, Blume ; Fl. Br. Ind. i. 62.

Trees or shrubs. *Sepals* 3, valvate or subimbricate. *Petals* 6, in 2 series, ovate or elongated, flat or the inner vaulted. *Torus* convex. *Stamens* cuneate ; anther-cells extrorse, remote. *Ovaries* indefinite. *style* usually oblong ; *ovules* 1-2. *Fruit* consisting of 1 or many dry or fleshy stalked 1-seeded carpels.—Tropical regions, chiefly of the Old World.

P. suberosa, *Benth. & Hk. f. in F. B. I. i. 65 ; Brand. For. Fl. 5 ; Watt E. D. ; King in Ann. R. Bot. Gard. Calc. iv, 64, t. 77B.* Uvaria suberosa, *Roxb.; Fl. Ind. ii,* 667. Guatteria suberosa, *Dun ; W. & A. Prod. 10 ; Hk. f. & T. Fl. Ind. 140.*

An evergreen shrub or small tree. *Branches* rufous-tomentose when young, becoming corky and rugged in age. *Leaves* 2-5 in. long, shortly petioled, oblong, obtuse, slightly narrowed to the somewhat oblique base ; membranous, glabrous and shining above, pubescent beneath when young ; main nerves about 6 pairs, rather faint. *Flowers* ¾ in. in diam., greenish-white, on slender pedicels, usually solitary and extra-axillary ; pedicels with an acuminate bract near the base. *Sepals* less than half the size of the petals, spreading, pubescent. *Petals* oval, reddish-brown, silky outside, the outer shorter. *Carpels* stalked, subspherical, silky when young, ¼ in. in diam. *Seeds* roundish, smooth.

Oudh Forests. DISTRIB.: Bengal, S. India, Ceylon. The tree is in flower during the greater portion of the year.

P. longifolia, *Benth. and Hk. f. in F. B. I. i. 62 ; Brand. For. Fl. 4 ; Watt E. D.; King in Ann. R. Bot. Gard. Calc. iv. 72, t. 99. Guatteria longifolia, Wall.; W. & A. Prod. 10 ; Hk. f. & T. Fl. Ind. 139. Uvaria longifolia, L.; Roxb. Fl. Ind. ii. 664 ; Royle Ill., 59.* Vern *Debdar* (N. India), *Asok* (S. India). A handsome evergreen tree with lanceolate acuminate shining undulate leaves. Although indigenous only in S. India and Ceylon, it thrives well in the gardens of Upper India, and has proved a very suitable tree for avenues, of which some fine examples may be seen in the R. Botanic Garden at Calcutta. The sacred character of this tree, as implied by some of its vernacular names, accounts for its often being met with near temples.

2. ANONA, Linn. ; Fl. Br. Ind. i. 78.

Trees or shrubs. *Flowers* 2-sexual, solitary or fascicled, terminal or leaf-opposed. *Sepals* 3, small, valvate. *Petals* 3 or 6, valvate. *Stamens* many, top of connective ovoid. *Ovaries* many, subconnate ; *ovule* solitary. Ripe *carpels* confluent into a many-celled ovoid or globose many-seeded fruit.

A. squamosa, *Linn. Sp. Pl. 537 ; Roxb. Fl. Ind. ii. 657 ; W. & A. Prod. 7 ; Royle Ill. 60 ; Hk. f. & T. Fl. Ind. 115 ; F. B. I. i. 78 ; Brand. For. Fl. 6. Watt E. D.* (Custard-Apple, or Sweet-Sop of America). Vern. *Sharifa, Sitaphal.*

A shrub or small tree, nearly evergreen. *Leaves* 2-3 in. long, stalked, oblong or oblong-lanceolate, obtuse or acuminate, base acute, glaucous beneath, pubescent when young. *Flowers* stalked, inserted on short branchlets. *Sepals* triangular, acute, united at the base. Outer *petals* 1 in. long, fleshy, inner minute or wanting. *Fruit* 2-4 in. across, yellowish-green, tubercled. *Seeds* oblong, brownish black, with a pale swelling at the hilum.

A native of Tropical America and the West Indies. It is extensively cultivated for its fruit in the hotter parts of India, and has so far become naturalized in Bundelkhand, the Central Provinces, and other places, especially in the neighbourhood of old forts, as to have often the appearance of being indigenous to the country. The flowers appear early in the hot weather, and the fruit ripens July-Sep.

Anona reticulata, L., Bullock's Heart, or Custard-Apple of the West Indies; and *A. muricata*, L. (Sour-Sop), are occasionally met with in Indian gardens. The former is the more abundant, and is becoming naturalized in many places.

3. MILIUSA, Leschen.; Fl. Br. Ind. i. 86.

Trees or shrubs. *Flowers* usually 2-sexual. *Sepals* 3, small, valvate. *Petals* 6, valvate, in two series, outer smaller and like the sepals, inner thin and cohering when young by their margins. *Torus* elongated, cylindric. *Anther*-cells contiguous, extrorse; connective more or less apiculate. *Ovaries* indefinite, linear-oblong; *ovules* usually 1 or 2, rarely more. Ripe *carpels* globose or oblong, 1-many-seeded.

M. velutina. *Hk. f. & T. Fl. Ind. 151; Brand. For. Fl. 6; F. B. I. i. 87; Watt E. D.; King in Ann. R. Bot. Gard. Calc. iv. 158, t. 205A.* Uvaria villosa, *Roxb. Fl. Ind. ii. 664.* Guatteria velutina, *Dun.; Royle Ill. 59.* Vern. *Gidar-rukh, Dom-sál* (N.-W. P.), *Bari kári* (Oudh).

A medium-sized tree. Young branches and leaves densely tomentose when young. *Leaves* shortly petioled, thickly membranous, variable in size, ovate-oblong or subrotund, minutely apiculate, obtuse or acute, rounded or slightly cordate at the base, both surfaces pale tomentose; main nerves 8-12 pairs, rather prominent on both surfaces. *Flowers* up to ½ in. long, on slender tomentose pedicels, solitary, or 2-3 from a shorter tomentose leaf-opposed peduncle. *Sepals* and outer *petals* small, ovate; inner *petals* much larger, blackish purple, glabrous inside. *Stamens* short, slightly apiculate. *Ovaries* ovoid, pubescent, 2-ovuled. *Stigma* subsessile. Ripe *carpels* puberulous, bluish purple, ½-¾ in. in diam. *Seeds* 2.

Dehra Dun and Siwalik range, Rohilkhand, Oudh, and Gorakhpur forests. DISTRIB.: Bengal, Central Provinces, Burma. The tree is leafless during the early part of the hot weather. Fl. March to May; fr. June and July. The leaves are much used as fodder.

4. SACCOPETALUM, Bennett; Fl. Br. Ind. i. 88.

Trees. *Leaves* deciduous. *Flowers* 2-sexual. *Sepals* 3, small, valvate. *Petals* 6, valvate, in two series, outer small and like the sepals; inner much larger, erect or conniving, saccate at the base. *Stamens* indefinite; *anther*-cells contiguous, connective produced into a conspicuous appendage. *Ovaries* many; *ovules* 6 or more. Ripe *carpels* sub-globose.

S. tomentosum, *Hk. f. & T. Fl. Ind. 152; D. & G. Bomb. Fl. 4; F. B. I. i. 88; Brand. For. Fl. 7; Watt E. D.; King in Ann. R. Bot. Gard. Calc. iv. 159, t. 207.* Uvaria tomentosa, *Roxb.; Fl. Ind. ii. 667; W. & A. Prod. 8.* Vern. *Karri* (Oudh).

A large tree, young branches tomentose. *Leaves* 6-12 in. long, shortly petioled, thickly membranous, ovate or ovate-oblong, sub-acute or rounded at the base; upper surface, except the midrib, glabrous or nearly so, pubescent or tomentose beneath when young; main nerves 6-11 pairs, prominent beneath. *Flowers* 1 in. in diam., leaf-opposed or subterminal, solitary or in pairs; pedicels slender, bracteate at the base. *Sepals* and outer *petals* minute, subequal, lanceolate, reflexed, pubescent; inner *petals* much larger, ovate-oblong, obtuse, saccate at the base. *Stamens* many, in several rows, minutely apiculate. *Ovaries* ovate, pointed, hirsute at the base; *ovules* about 6, in two rows; *stigma* sessile. Ripe *carpels* globose, tapering to the base, pubescent, dark purple, 1 in. in diam.

Dehra Dun and Siwalik range; forests of Oudh. DISTRIB.: Southward from Behar and Konkan to Travancore. The leaves turn to an orange-yellow colour before falling in March, the flowers appearing with the new leaves in April; fruit ripens in June. The leaves are used as fodder.

IV.—MENISPERMACEÆ.

CLIMBING or twining rarely erect shrubs. *Leaves* alternate, entire or lobed; *stipules* 0. *Flowers* small, diœcious or polygamous. *Sepals* usually 6, free, imbricate, in 2 series, outer often minute. *Petals* usually 6, or wanting. MALE fl.: *Stamens* hypogynous, usually 1 opp. each petal; *filaments* free or connate; rudimentary carpels small or 0. FEM. fl.: Staminodes 6 or 0. *Ovaries* usually 3; *ovules* generally solitary. Ripe *carpels* drupaceous, with the style-scar subterminal, or by eccentric growth near the base. *Seed* curved or reniform; albumen even or ruminate or none.—Species nearly all tropical.

For an account of the peculiar structure of the wood in this family see Brandis For. Fl. p 10. The plants of this family ar

remarkable for their bitter and narcotic properties, and many of them are valued medicinally.

Carpels 3 or more.

Seed ovoid or reniform.

Style-scar subterminal; pet. 6; stam. distinct . 1. TINOSPORA.

Style-scar lateral or subbasal; pet. 0; stam. 1-adelphous . . . . . 2. ANAMIRTA.

Seed horseshoe-shaped or hooked.

Styles subulate.

Dry fruit not tubercled; albumen ruminate . 3. TILIACORA.

Dry fruit tubercled; albumen not ruminate . 4. COCCULUS.

Styles forked . . . . . 5. PERICAMPYLUS.

Carpels solitary.

Sep. of male fl. 6; pet. distinct . . . . 6. STEPHANIA.

Sep. of male fl. 4; pet. connate . . . . 7. CISSAMPELOS.

1. TINOSPORA, Miers; Fl. Br. Ind. i. 96.

Climbing shrubs. *Flowers* in axillary or terminal racemes or panicles. *Sepals* 6, 2-seriate; inner larger, membranous. *Petals* 6, smaller. MALE fl.: *Stam.* 6; *filaments* free, tips thickened; *anther*-cells obliquely adnate. FEM. fl. *Staminodes* 6, clavate. *Ovaries* 3; stigmas forked. *Drupes* 1-3; style-scar subterminal; endocarp rugose. *Seed* grooved ventrally, or curved round the intruded and 2-lobed endocarp; albumen ventrally ruminate.

T. cordifolia, *Miers in Ann. & Mag. Nat. Hist. Ser. II, vii (1851) 38; Hk. f. & T. Fl. Ind. 184; D. & G. Bomb. Fl. 5; F. B. I. i, 97; Brand. For. Fl. 8; Watt E. D.* Menispermum cordifolium, Willd.; *Roxb. Fl. Ind. iii, 811.* Cocculus cordifolius, *DC.; W. & A. Prod. 12; Royle Ill. 61.* Vern. *Gulel, guloh, gulancha.*

A glabrous climbing succulent shrub with rough corky bark. *Leaves* petioled, 2-4 in. in diam., cordate, acute or acuminate, glabrous. *Flowers* small, yellow. MALE fl. in fascicles. *Sepals* oval. *Petals* ½ the length of the sepals, wedge-shaped *Anther*-cells immersed in the fleshy summit of the filament FEM. fl. usually solitary. *Sepals* and *petals* as in the male. *Ovaries* on a fleshy receptacle; *style* very short. Ripe *carpels* pisiform, red.

Dehra Dun, Oudh, Merwára, Bundelkhand, common in hedges. DISTRIB.: throughout Trop. India, also in Burma and Ceylon. Flowers in the hot and rainy seasons. The roots and stems (*gulancha*) are much used medicinally. Long filiform aerial roots are frequently developed from the branches.

2. ANAMIRTA, Colebr.; Fl. Br. Ind. i. 98.

Woody climbers. *Flowers* in panicles. *Sepals* 6, with 2 appressed bracts. *Petals* 0. MALE fl.: *Anthers* sessile, on a stout column, 2-celled, bursting transversely. FEM. fl.: *Staminodes* 9, clavate, 1-seriate. *Ovaries* 3, on a short gynophore; *stigma* subcapitate, reflexed. *Drupes* on a 3-fid gynophore, obliquely ovoid, dorsally gibbous; *style-scar* subbasal; endocarp woody. *Seed* globose, embracing the subglobose hollow intruded endocarp; albumen dense, of horny granules; embryo curved. —Trop. Asia.

A. paniculata, *Colebr. in Trans. Linn. Soc. xiii, 661.* A. Cocculus, *W. & A. Prod. 446; Hk. f. & T. Fl. Ind. 185; F. B I. i. 98; Brand. For. Fl. 8; Watt E.D.* Menispermum Cocculus. *Linn.; Roxb. Fl. Ind. iii, 807.* M. heteroclitum, *Roxb. l. c. 817.* Cocculus suberosus, *W. & A. Prod. 11; Royle Ill. 61.* Vern. *Kakmári.*

A large woody climber with corky bark. *Leaves* 4-8 in. long, broadly ovate, acute or obtuse, rounded or subcordate at the base, thinly coriaceous, glabrous above, paler and with small tufts of hairs in the axils of the veins beneath; petioles thickened and prehensile at the lower ends. *Flowers* from the old wood, ¼ in. in diam, pale greenish-yellow, sweet-scented. *Sepals* imbricate, ultimately reflexed. Ripe *carpels* subglobose, ½ in., smooth, black.

Forests of N. Oudh (R. Thompson). DISTRIB.: E. Bengal; S. India to Ceylon and Malay Archipelago. The bitter berries of this plant, known as, 'Cocculus indicus,' are used in India for intoxicating fish and crows and in England for the adulteration of beer.

3. TILIACORA, Colebr.; Fl. Br. Ind. i. 99.

An evergreen climbing shrub. *Flowers* in axillary panicles, dicœcious or polygamous. *Sepals* 6, 2-seriate, outer much smaller. *Petals* 6, minute, cuneate. MALE fl.: *Stamens* 6, *filaments* subcylindric; *anthers* adnate. FEM. fl.: *Ovaries* 3-12; style-scar subbasal. *Seed* hooked; albumen ruminate; cotyledons linear. —A single species.

T. racemosa, *Colebr. in Trans. Linn. Soc. xxiii. 67; F. B. I. i. 99; Brand. For. Fl. 10; Watt E. D.* T. acuminata, *Miers; Hk. f. & T. Fl. Ind. 187.* Menispermum polycarpum, *Roxb. Fl. Ind. iii, 816.* Cocculus acuminatus, *W. & A. Prod. 12.* Vern. *Karwanth, rangoe* (Oudh), *tiliakora* (Beng.).

Young shoots glabrous. *Leaves* 4-5 in., ovate or ovate-cordate, acuminate, somewhat 3-veined, undulate, glabrous, dark green; petiole ¾-1 in., slender. *Panicles* 6-12 in., hoary, at length glabrous; male branches 3-7-flowered; fem. simple, 1-flowered. *Flowers* ¼ in.,

yellow. Ripe *carpels* 1-10. ½ in., smooth, red or yellow; endocarp wrinkled. *Seed* bent double.

Oudh forests. DISTRIB.: Bengal to Orissa and Konkan; Ceylon; Singapore; Java. The long flexible branches are used for thatching and for basket work.

4. COCCULUS, DC.; Fl. Br. Ind. i. 101.

Climbing or sarmentose shrubs, rarely suberect. *Petiole* not dilated at the base. *Flowers* panicled. *Sepals* 6, 2-seriate, outer smaller. *Petals* 6, smaller than the sepals, usually auricled. MALE fl.: *Stamens* embraced by the petals; *anthers* subglobose, cells bursting transversely. FEM. fl.: *Staminodes* 6 or 0. *Ovaries* 3-6; *styles* usually cylindric. *Drupes* laterally compressed; endocarp horseshoe-shaped, dorsally keeled and tubercled, sides excavate. *Seed* curved; albumen fleshy; embryo annular. —In all warm climates.

A small tree with glabrous shining coriaceous leaves 1. *C. laurifolius.*

Climbing shrubs—

Leaves villous and green	2. *C. villosus.*
Leaves glabrous, glaucous	3. *C. Leæba.*

1. C. laurifolius, *DC. Syst. i, 520; Hk. f. & T. Fl. Ind. 191; F. B. I. i. 101; Brand. For. Fl. 9.* Menispermum laurifolium, *Roxb. Fl. Ind. iii. 815.* Vern. *Tilphara* (Dehra Dun).

A small handsome evergreen tree. *Leaves* on short petioles, 3-6 in. long, 3-nerved, lanceolate, acute or acuminate, dark green, coriaceous, glabrous and shining. *Panicles* axillary, shorter than the leaves, solitary or 2 superposed; bracts deciduous, hairy. *Flowers* minute. *Sepals* acute. *Petals* 2-lobed. *Styles* reflexed. *Drupes* globose, minute.

Dehra Dun, in shady moist localities. DISTRIB.: Subtrop. Himalaya, from the Ravi to Nepal up to 5 or 6,000 ft.; also in Japan.

2. C. villosus, *DC. Syst i, 525; W. & A. Prod. 13; Hk. f. & T. Fl. Ind. 193: D. & G. Bomb. Fl. 5; F. B. I. i. 101; Brand. For. Fl. 9; Watt E. D.* Menispermum hirsutum, *Roxb. Fl. Ind. iii; 814.* Vern. *Hier, Karsane* (Oudh).

A climbing undershrub. Branchlets leaves and inflor. clothed with greyish hairs. *Leaves* 2-3 in. long, petioled, ovate or ovate-oblong, occasionally 3-lobed, obtuse or mucronate, sub-cordate or truncate at the base, villous, rarely subglabrous. MALE fl. in short axillary panicles. FEM. fl. 1-3, on axillary pedicels, rarely racemed; bracts minute, linear. *Drupes* dark purple ¼ in. in diam.; endocarp annular, perforated.

Abundant throughout the area in hedges and waste places. DISTRIB.: Punjab Plain and base of Himalaya to Malabar and Pegu;

also in Trop. Africa. Fl. in Feb. and March. The juice of the ripe fruit makes a durable bluish-purple ink. The roots and leaves are used in native medicine.

3. **C. Leæba**, *DC. Syst. i. 529; Hk. f. & T. Fl. Ind. 192; F. B. I. i. 102; Brand. For. Fl. 13; Watt E. D.*; C. glaber, *W. & A. Prod. 13.* Vern. *Vallur.*

A climbing shrub with long slender puberulous branchlets. *Leaves* ½-1½ in. long, petioled, linear-oblong or trapezoid, entire or lobed, obtuse or mucronate, cuneate or rounded at the base, glabrous, becoming glaucous on both surfaces when old. MALE fl. many, minute, shortly pedicelled and arranged in axillary panicles. FEM. fl. solitary, on slender axillary peduncles. *Drupe* reniform, compressed, ½ in. in diam.

Rohilkhand and Merwara, in arid places. DISTRIB.: Punjab Plain, Sindh and Karnatic; also in Afghanistan, Arabia, Trop. and subtrop. Africa. Fl. throughout the year.

5. PERICAMPYLUS, Miers; Fl. Br. Ind. i. 102.

Leaves subpeltate; petioles slender, articulate. *Flowers* in axillary cymes. *Sepals* 6, with 3 bracts; outer smaller; inner spathulate. *Petals* 6, cuneate. MALE fl.: *Stamens* 6; *filaments* cylindric; *anthers* adnate, bursting transversely. FEM. fl.: *Staminodes* 6, clavate. *Ovaries* 3; *styles* 2-partite, segments subulate. *Drupes* subglobose; endocarp horseshoe-shaped, dorsally crested or echinate; sides excavated. *Seed* curved.

P. incanus, *Miers. in Ann. & Mag. Nat Hist. Ser. II. vii. (1851) 40; Hk. f. & T. Fl. Ind. 194; F. B. I. i. 102; Watt E. D.* Menispermum villosum, *Roxb. Fl. Ind. iii. 812 (not of Lamk.)*

A climbing shrub with tomentose branchlets, afterwards glabrate *Leaves* petioled, 2-4 in. in diam., suborbicular, obtuse, acute or retuse base truncate or subcordate. *Cymes* di- or trichotomous, often many and superposed; *bracts* subulate. *Sepals* villous. *Petals* acute or obtuse, margins incurved. *Drupes* red.

Rohilkhand and Oudh. DISTRIB.: Sikkim, Assam, Khasia Hills Chittagong, Malay Penins. and Malay Islands.

6. STEPHANIA, Lour.: Fl. Br. Ind. i. 102.

Climbing shrubs. *Leaves* usually peltate. *Flowers* in axillary cymose umbels. MALE fl.: *Sepals* 6-10, free, ovate or obovate. *Petals* 3-5, obovate, fleshy. *Anthers* 6, connate, encircling the top of the staminal column, bursting transversely. FEM. fl.: *Sepals* 3-5. *Petals* as in male. *Staminodes* 0.

Ovary 1; *style* 3-6-partite. *Drupe* glabrous; endocarp compressed, horseshoe-shaped, dorsally tubercled, sides hollowed and perforated. *Seed* almost annular.—Tropical portions of the Old World.

Flowers in capitate umbels	1. *S. discolor.*
Flowers in lax umbellate cymes . . .	2. *S. rotunda.*

1. S. discolor, *Spreng. Syst. iv. Cur. Post. 316.* S. hernandifolia, Walp; *Hk. f. & T. Fl. Ind. 196; F. B. I. i, 103*; *Watt E. D.* Cissampelos hernandifolia, *Willd.*; *Roxb. Fl. Ind. iii, 842*; C. hexandra, *Roxb. l. c. 841.* Clypea hernandifolia, *W. & A. Prod. 14.*

Leaves 3-6 in. in diam., ovate or subdeltoid, acute obtuse or acuminate, base truncate or subcordate, pale or glaucous and sometimes thinly puberulous beneath; petioles 1½-4 in. *Flowers* greenish-white, very small, nearly sessile, in small capitate umbels at the ends of axillary peduncles. *Sepals* of male fl. obovate, obtuse; of fem. fl. acute. *Petals* 3-4, much shorter. *Drupes* red.

Dehra Dun. DISTRIB.: Nepal to Chittagong, and south to Singapore, Ceylon, Malay Pen., and Malay Islands; also in Australia and Africa.

2. S. rotunda, *Lour. Fl. Cochinch. 608; Hk. f. & T. Fl. Ind. 197; F. B. I. i. 103.* Cocculus Roxburghianus, *Wall.*; *W. & A. Prod. 450.* Cissampelos glabra, *Roxb. Fl. Ind. iii, 840.* Vern. *Purha* (Dehra Dun).

Roots subglobose. *Leaves* 3-7 in. in diam., broadly ovate or suborbicular, often repand or sinuate-lobed, glabrous, pale beneath; petioles 3-9 in. *Umbels* in lax cymes; peduncles of fem. fl. stouter than those of male; bracts subulate. *Flowers* ⅛-¼ in., yellow. *Sepals* narrow, cuneate, puberulous. *Petals* shorter. *Drupe* pisiform.

Dehra Dun. DISTRIB.: Trop. and temp. Himalaya, up to 7,000 ft.; Punjab; Khasia Hills; Pegu; S. India; also in Siam and Cochinchina. Roxburgh states that the acrid root is used medicinally in Sylhet.

7. CISSAMPELOS, Linn.; Fl. Br. Ind. i. 103.

Suberect or twining shrubs. *Leaves* often peltate. MALE fl.: cymose. *Sepals* 4, or 5-6, erose. *Petals* 4, connate, forming a 4-lobed cup. *Anthers* 4, connate, encircling the top of the stam.-column, bursting transversely. FEM. fl. racemed, crowded in the axils of leafy bracts. *Sepals* 2 (or sep. and pet. 1 each), 2-nerved, adnate to the bracts. *Staminodes* 0. *Ovary* 1; *style* short, 3-fid. *Drupe* ovoid, style-scar subbasal; endocarp horseshoe-shaped, compressed, dorsally tubercled, sides excavated. *Seed* curved; embryo slender.

C. Pareira, *Linn. Sp. Pl. 1013; Hk. f. & T. Fl. Ind. 198*; *D. & G. Bomb. Fl. 5*; *F. B. I. i. 104*; *Brand. For. Fl. 10, 571*; *Watt E. D.* C.

caapeba, *L.; Roxb. Fl. Ind. iii. 842.* C. convolvulacea, *Willd.; Roxb. l.c.; W. & A. Prod. 14.* C. obtecta, *Wall.; Royle Ill. 61.* Vern. *Dakhnirbisi* (N.-W. Prov.), *Harjewri* (Oudh), *Purhe* (Dehra Dun).

A twining shrub. *Stem* short, throwing out long herbaceous tomentose branches. *Leaves* 1-4 in., usually peltate, orbicular to reniform, more or less cordate at the base, apex obtusely mucronate. *Male cymes* long-peduncled, axillary or nearly so, many fld., hairy; *bracts* minute. *Racemes of fem. fl.* 1-2, axillary, with large reniform or orbicular hoary bracts. *Drupes* ¼ in., subglobose, hirsute, scarlet.

Abundant throughout the area. DISTRIB.: Trop. and subtrop. India from Sindh and the Punjab to Ceylon and Singapore. Cosmopolitan in warm countries. Very variable as to the shape of the leaves and in the amount of hairiness of the whole plant. The root-bark and leaves are used medicinally, and often as a substitute for the true "Pareira brava" of commerce, which is now known to be the produce of *Chondrodendron tomentosum*, Ruiz. & Pav., a native of Peru and Brazil.

V.—BERBERIDEÆ.

ERECT or climbing shrubs, or glabrous herbs. *Leaves* simple or compound with articulate segments, rarely stipulate; buds scaly. *Flowers* often globose, regular, solitary or in simple or compound racemes, usually yellow or white. *Sepals* and *petals* free, hypogynous, 2-many-seriate, usually in whorls of 3 and imbricate, caducous. *Stamens* usually 4-6, opposite the petals, free or connate; *anthers* adnate, dehiscing by slits or (in Berberis) by two ascending lids. *Carpels* 1-3, rarely more, oblong; *style* short or 0.; *stigma* dilated or conic or oblong. Ripe *carpels* usually indehiscent.—Chiefly temperate or inhabiting mountains.

To this family belongs *Podophyllum emodi*, Wall., a perennial herb occurring more or less abundantly throughout the Himalayan ranges between 6 and 14,000 ft.. The rootstock contains a valuable medicinal resin known as 'podophyllin,' which hitherto has been chiefly prepared from *P. peltatum*, the N. American representative of the genus. See *Watt E. D.*

7. BERBERIS, Linn.; Fl. Br. Ind. i. 108.

Spiny shrubs with yellow wood. *Leaves* imparipinnate or in fascicles of unifoliolate leaflets in the axils of 3-5-partite spines, often themselves reduced to spines. *Flowers* yellow, 2-sexual, in racemes or fascicles, rarely solitary. *Sepals* 6, with 2-3 appressed bracts, imbricate in 2 series. *Petals* 6, imbricate in 2 series, usually with 2 basal glands inside. *Stamens* 6, free; *anther*-cells opening by

recurved valves. *Ovary* simple. *Stigma* peltate, sessile or on a short *style*. *Ovules* few, basal, erect. *Fruit* a berry. *Seeds* few.

Leaves narrowly lanceolate or oblanceolate, not lacunose	1. *B. Lycium.*
Leaves obovate or orbicular, lacunose and strongly reticulate beneath	2. *B. asiatica.*

1. B. Lycium, *Royle Ill. 64 ; Hk. f. & T. 225 ; F. B. I. i. 110 ; Brand. For. Fl. 12 ; Watt E.D.* Vern. *Chatroi*, (Káshmal).

A rigid erect spinous shrub, 6-8 ft. high, bark white. *Leaves* 1-foliolate ; *leaflets* 1½-2½ in. long, nearly sessile, fasciculate, subpersistent, coriaceous, narrowly lanceolate or oblanceolate, mucronate, entire or spinuloes, not lacunose, bright green above, glaucous beneath and with prominent lax reticulate veins. *Flowers* small, pale yellow, on elongate racemes. *Berries* ovoid, violet. *Style* distinct. *Stigma* capitate.

Dehra Dun. DISTRIB. : W. Himalaya from Hazara to Nepal, up to 9,000 ft. usually easily recognizable, but some of its forms might be mistaken for *B. aristata,* and others resemble *B. asiatica.* Flowers in April, fruit ripens in June. An extract called 'rasaut,' prepared from the wood, is much valued medicinally in ophthalmic cases.

2. B. asiatica, *Roxb. in DC. Syst. II, 13 ; Fl. Ind. ii, 182 ; Hk. f. & T. Fl. Ind. 224 ; F.B.I. i, 110 ; Brand. For. Fl. 12 ; Watt E.D.*—Vern. *Kingora* (Dehra Dun and Garhwal).

A stout erect spinous shrub up to 6 ft. high ; bark pale. *Leaves* 1-foliolate ; *leaflets* in fascicles, 1-3 in. long, obovate or orbicular, subentire or with large distant spinescent teeth, rigidly coriaceous, whitish beneath and with strong reticulate venation, lacunose between the veins. *Flowers* in short corymbose racemes, rather small ; glands of nectary subcylindric. *Berry* large, ovoid or subglobose, red or black, glaucous. *Style* distinct. *Stigma* capitate.

Dehra Dun. DISTRIB. : Outer Himalaya from Garhwál to Bhután ; Parasnáth ; Afghanistán. Flowers Feb.-April, fruit May and June. Medicinal properties similar to those of *B. Lycium.* The berries are eaten.

VI.—NYMPHÆACEÆ.

AQUATIC perennial herbs. *Leaves* usually floating, often peltate, margins involute in vernation. *Scapes* 1-fid, naked. *Floral envelopes* all free, hypogynous or adnate to a fleshy disk that surrounds or envelops the carpels. *Sepals* 3-5. *Petals* 3-5 or many. *Stamens* many. *Carpels* 3 or more, in one whorl, free or connate or irregularly sunk in pits of the disk; *stigmas* as many as the carpels, peltate or decurrent ; *ovules* few or many, scattered

over the walls of the cells. *Fruit* formed of the connate carpels, or of separate and indehiscent carpels, or of the enlarged turbinate flat-topped disk with the nut-like carpels sunk in its crown. *Seeds* naked or arilled; albumen floury or 0; embryo inclosed in the large amniotic sac. Temperate and tropical.

Leaves floating, seeds albuminous	
Smooth herbs with white pink or red floating flowers	1. NYMPHÆA.
A prickly herb with violet-coloured partially submerged flowers	2. EURYALE.
Leaves and flowers raised above the surface of the water, seeds exalbuminous	3. NELUMBIUM.

1. NYMPHÆA, Linn.; Fl. Brit. Ind. i. 114.

Large aquatic herbs. *Rootstock* creeping. *Leaves* and flowers floating. *Flowers* expanded, large, solitary, on long radical scapes. *Sepals* 4, adnate to the base of the disk. *Petals* in many series, successively transformed into stamens, all adnate to the disk. *Filaments* petaloid. *Anthers* small, linear, slits introrse. *Ovaries* many, in one series, sunk in the fleshy disk, and with it forming a many-celled ovary crowned by connate radiating stigmas; *ovules* many. *Fruit* a spongy berry, ripening under water. *Seeds* small, buried in pulp.

Leaves sharply toothed, anthers without appendages	1. *N. Lotus*.
Leaves entire or obtusely toothed, anthers with long appendages	2. *N. stellata*.

1. **N. Lotus**, *Linn. Sp. Pl. 511; Roxb. Fl. Ind. ii, 577; Hk. f. & T. Fl. Ind. 241; D & G. Bomb.; Fl. 6; F. B. I. i, 114; Watt E. D.* Vern. *Chota kanval.* (Indian Lotus.)

Rootstock short, erect, roundish, tuberous. *Leaves* 6-12 in. across, on long cylindrical submerged petioles, sharply sinuate-toothed, downy beneath, sagittate when young. *Flowers* 2-10 in. in diam., white or pink. *Sepals* oblong, obtuse, 5-10-ribbed, glabrous or pilose externally. *Petals* oblong. *Filaments* broadly dilated at the base. *Anthers* without appendages. *Fruit* 1½ in. in diam.; stigmatic rays with clubbed appendages. *Seeds* broadly ellipsoid, rough.

Common throughout the area, flowering during the rainy season. DISTRIB.: Warmer parts of India, extending to Africa, Java, and the Philippines; it also occurs in Hungary in the neighbourhood of hot springs. The tuberous underground stems are eaten and also used medicinally.

VAR. pubescens, *Hk. f. & T. l.c.* N. pubescens, *Willd.; W. & A. Prod. 17.* Leaves more densely tomentose beneath; flowers smaller, 3-4 in. in diam.; sepals acute. Distribution as of type.

2. N. stellata, *Willd. Sp. Pl. ii, 1153; Roxb. Fl. Ind. ii. 579; W. & A. Prod. 17; Hk. f. & T. Fl. Ind. 243; D. & G. Bomb. Fl. 6; F. B. I. i. 114; Watt E. D.* Vern. *Bambher.*

Leaves orbicular or elliptic, quite entire or obtusely sinuate-toothed, often blotched, with purple beneath. *Flowers* up to 10 in. in diam., blue, white, rose, or purple, slightly scented. *Sepals* not ribbed, often streaked with fine short purple lines *Petals* 10-30, linear-oblong or lanceolate, acute or taper-pointed. *Stamens* 10-50. *Anthers* with long appendages. *Stigmatic* rays without appendages.

Abundant within the area. DISTRIB.: Throughout the warmer parts of India; also in Africa. The rhizomes and seeds are often eaten, especially in times of scarcity.

The allusions to the 'Sacred Lotus' in ancient Hindi literature appear to refer equally to different kinds of *Nymphæa* as to *Nelumbium speciosum.* The description, however, of the "flower floating upon the waters" suggests *Nymphæa* rather than *Nelumbium.*

VAR. 1. cyanea, *Hk. f. & T. l.c.; F.B. I. l.c.* N. cyanea, *Roxb. Fl. Ind., ii, 577; W. & A. Prod. l.c.* Flowers medium-sized, blue, hardly scented.

VAR. 2. parviflora, *Hk. f. & T. l.c.* N. stellata, *Willd.; W. & A. Prod. l.c.* Flowers usually smaller, blue; the leaves are also smaller.

VAR. 3. versicolor, *Hk. f. & T. l.c.* N. versicolor, *Roxb., Fl. Ind. l.c.* Flowers larger, white, blue, purple or flesh-coloured; stamens very many.

2. EURYALE, Salisb.; Fl. Brit. Ind. i. 115.

A densely prickly aquatic herb; rootstock thick. *Leaves* orbicular, corrugate. *Flowers* violet-coloured, partially submerged. *Sepals* 4, erect, inserted on the edge of the torus above the carpels. *Petals* numerous, 3-5-seriate, shorter than the sepals. *Stamens* many, many-seriate, in bundles of eight; *filaments* linear. *Ovary* 8-celled, sunk in the dilated top of the torus; *stigma* discoid, depressed, concave; *ovules* few, parietal. *Berry* spongy, crowned with the persistent sepals. *Seeds* 8-20; aril pulpy; testa thick, black.

E. ferox, *Salisb. in Kon. & Sims Ann. Bot., ii, 74; Royle Ill. 65; Hk. f. & T. Fl. Ind. 245; F. B. I. i, 115; Watt E. D.* Anneslia spinosa, *Roxb. Fl. Ind., ii, 573.*

Rootstock short. *Leaves* 1-4 ft. in diam., oval or orbicular, green above, downy and red or purple beneath, with strong spiny ribs. *Flowers* 1-2 in. long, violet-coloured inside, green and shining outside. *Sepals* with recurved spines on their backs. *Petals* about 20, narrowly ovate-oblong, inner smaller. *Berry* 2-4 in. in diam., nearly round. *Seeds* about 20, from the size of a pea to that of a cherry.

Oudh, in jhils. DISTRIB.: Eastward to E. Bengal and China; also in Kashmir. It flowers during the rains. The farinaceous seeds are eaten after being roasted in hot sand.

3. NELUMBIUM, Juss.; Fl. Brit. Ind. i., 115.

Aquatic herbs with slender elongated rhizomes. Leaves and flowers raised high above the water. *Leaves* peltate. *Flowers* pink, white or yellow. *Sepals* 4-5, caducous. *Petals* and *stamens* many, hypogynous, many-seriate, caducous. *Anthers* with a club-shaped appendage. *Ovaries* many, 1-celled, sunk in the flat top of an obconic fleshy torus; *style* short, exserted; *stigma* terminal, dilated; *ovules* 1-2, pendulous. Ripe *carpels* 1-seeded, ovoid, loose in the cavities of the enlarged spongy torus; pericarp bony, smooth. *Seed* filling the carpel, without albumen. Two species are known, one found in Asia, N. Africa and Australia; the other in N. America.

N. speciosum, *Willd. Sp. Pl. 1258; Roxb. Fl. Ind. ii, 647; W. & A. Prod. 16; Royle Ill. 65; Hk. f. & T. Fl. Ind. 247.* Vern. *Kanwal* (The Sacred Lotus).

A large handsome aquatic herb with milky juice. *Rootstock* creeping, much-branched. *Peduncles* and *leaf-stalks* 3-6 ft. long, full of spiral vessels, smooth or with small scattered prickles. *Leaves* 2-3 ft. in diam., orbicular, entire, membranous, glaucous, cupped. *Flowers* solitary, 4-10 in. in diam. white or rose. *Petals* elliptic, concave. *Torus* in fruit 2-4 in. in diam.

Common in jhils and tanks, often cultivated; in flower during the hot season. DISTRIB.: Throughout India, as far north as Kashmir; also in Persia, N. Africa, Malay Islands, China, Japan, and Trop. Australia. The rhizomes, stalks, flowers and seeds are eaten, and various parts of the plant are used medicinally. This is the 'Sacred Bean' of ancient Egypt, but it no longer grows in that country. Much venerated by Hindus from very ancient times.

VII.—PAPAVERACEÆ.

ANNUAL, rarely perennial herbs, often with milky or coloured sap. *Leaves* alternate, or the upper ones rarely sub-opposite. *Stipules* 0. *Flowers* hermaphrodite, regular or irregular. *Sepals* 2 or 3, rarely 4, caducous *Petals* 4-6, rarely more, deciduous. *Stamens* indefinite or few, hypogynous, free or djadelphous; *anthers* 2, rarely 1-celled, dehiscing longitudinally. *Ovary* free, usually 1-celled and containing many ovules on parietal placentas; *stigma* simple or divided. *Fruit* a capsule opening by pores, rarely indehiscent. —Species about 200; found chiefly in the N. Temperate zone.

Eschscholtzia californica, Cham. (Californian Poppy) is frequently grown as a cold-weather annual in the plains.

Sap milky or coloured, flowers regular; stamens indefinite, free.	
Glaucous or hispid herbs with milky sap	1. PAPAVER.
A prickly herb with yellow sap	2. ARGEMONE.
Sap watery, flowers irregular; stamens 6, diadelphous	3. FUMARIA.

1. PAPAVER, Linn.; Fl. Brit. Ind. i. 116.

Annual, rarely perennial herbs, with milky juice. *Leaves* lobed or cut. *Flowers* on long peduncles. *Ovary* 1-celled; *stigma* discoid or pyramidal, with radiating lobes opposite the placentas, which project into the cell. *Capsule* short, opening by small valves under the lobes of the persistent stigma. *Seeds* small, pitted.

P. somniferum, *Linn. Sp. Pl. 508; Roxb. Fl. Ind. ii, 571; W. & A. Prod. 17; Hk. f. & T. Fl. Ind. 250; F. B. I. i. 117; Field & Gard. Crops N. W. P. & Oudh, i. 64, t. XV; Watt E. D.* Vern. *Post, afim.* (Opium Poppy.)

A glaucous annual, usually quite glabrous, rarely branched. *Leaves* oblong, amplexicaul, lobed; lobes dentate. *Flowers* large, white, sometimes purple or scarlet. *Capsule* stalked, 1 in. in diam. globose, glabrous; *stigmatic rays* 5-12. *Seeds* white or black.

Largely cultivated as a cold-weather crop within the area, but chiefly in the Eastern districts. Occasionally met with as an escape. The Opium Poppy, unknown as a wild plant, is now generally regarded as having originated through cultivation from a Mediterranean species, *P. setigerum*, which differs chiefly in being more or less hispid; it also has fewer stigmas. *P. Rhœas*, Linn., *var. latifolia*, is grown as an ornamental annual in many gardens of Upper India.

2. ARGEMONE, Linn.; Fl. Brit. Ind. i. 117.

Erect glaucous herbs with yellow juice. *Leaves* with spiny teeth. *Flowers* large, showy. *Sepals* 2 or 3. *Petals* 4-6. *Stamens* many. *Ovary* 1-celled; *style* very short; *stigma* 3-6-lobed; *ovules* many, on 4-6 parietal placentas. *Capsule* prickly, dehiscing at the top by short valves. *Seeds* many.—Natives of the warmer parts of America, of which the following species has become naturalized in India.

A. mexicana, *Linn. Sp. Pl. 508; Roxb. Fl. Ind. ii, 571; W. & A. Prod. 18; Royle Ill. 66; Hk. f. & T. Fl. Ind. 251; F. B. I. i, 117; Watt E. D.* (Mexican or Prickly Poppy.)

A robust herb 1-2 ft. high; stem often almost woody below, simple or sparingly branched. *Leaves* 3-7 in. long, sessile, ½ amplexicaul, sinuate-pinnatifid, glaucous, white-spotted, prickly. *Flowers* 1-3 in. in diam., sessile or subsessile, yellow or rarely white. *Sepals* horned at the top and bristle-pointed. *Capsule* ¾-1½ in. long, elliptic or oblong, bristly.

A common weed on waste ground. DISTRIB.: Throughout India. Introduced from America within historic times. It flowers during the cold season. The juice and the oil yielded by the seeds are used medicinally; the oil is also valued for painting purposes.

3. FUMARIA. Linn.; Fl. Brit. Ind. i. 127.

Herbs, mostly annual, usually branched, often scandent. *Leaves* finely divided; segments narrow. *Flowers* small, in terminal or leaf-opposed racemes. *Sepals* 2, small. *Petals* erect or conniving, 2 outer dissimilar; anterior flat or concave; posterior gibbous or spurred at the base; 2 inner narrow, cohering by their tips, winged or keeled at the back. *Stamens* 6, in two bundles opposite the outer petal, one filament usually spurred; central *anther* of each bundle 2-celled, lateral 1-celled. *Ovary* 1-celled; *style* slender; *stigma* entire or shortly lobed; *ovules* 2, on 2 placentas. *Fruit* indehiscent, globose, 1-seeded.

F. parviflora, *Lamk. Encycl. ii, 567*, sub.-sp. VAILLANTII, *Lois* (sp.); *F.B.I. i, 128.* F. parviflora, *Roxb. Fl. Ind. iii, 217; W. & A. Prod. 18; Royle Ill. 16; D. & G. Bomb. Fl. 7; Watt E. D.* (Fumitory).

A pale-green diffuse much-branched herb. *Leaf-segments* flat. *Racemes* 1-2 in., lax-flowered. *Flowers* ¼-⅓ in.; pedicels exceeding the bracts. *Sepals* lanceolate, much smaller than the corolla-tube. *Petals* whitish or rose-coloured with purple tips. *Fruit* globose, rugose when dry, rounded at the top and with 2 pits.

Common throughout the area as a weed of cultivation, flowering and fruiting during the cold season. DISTRIB.: Over the greater part of India, ascending to 8,000 ft. on the Himalaya; also in temp. regions of the Old World. The plant is used as a remedy for fever and ague.

IX.—CRUCIFERÆ.

HERBS, rarely undershrubs, with watery and often pungent sap. *Leaves* cauline and radical, the latter generally forming a rosette; cauline alternate, exstipulate. *Flowers* usually in corymbs or racemes. *Sepals* 4, free, imbricate, deciduous, the 2 lateral often saccate at the base. *Petals* 4, free, hypogynous, placed crosswise, imbricate, sometimes absent. *Stamens* usually 6, the 2 outer opposite the lateral sepals, 4 inner longer, in opposite pairs. *Disk* with 4 glands

opposite the sepals. *Ovary* 2-celled by a placental membrane, or 1-celled, or with superimposed cellules; *style* short and usually persistent or none. *Stigma* simple or 2-lobed; *ovules* usually many, in 1 or 2 series on the 2 parietal placentas. *Fruit* a 2-celled 2-valved pod, the valves deciduous and leaving the seeds on the placentas, or indehiscent or transversely jointed. *Seeds* small, albumen 0. *Cotyledons* large; radicle turned up on the back of one cotyledon (incumbent), or facing the edges of both (accumbent).

A large and widely distributed family, containing over 1,200 species. They are found most abundantly in the temperate and cooler regions of the N. Hemisphere. In the Polar regions and on the higher mountain ranges they often reach the limit of phænogamous vegetation; consequently very few indigenous species are met with in the plains of India, and the majority of these are annuals which flower and ripen their seeds within the period of the cold season. As a family it is easily recognized by the 4 free cruciform petals, and by the 6 stamens, 4 of which are long and 2 short (*tetradynamous*). For the correct determination of the genera, however, it is necessary to examine the internal structure of the seed. The family is also generally characterized by its antiscorbutic properties, and this fact no doubt determined the selection in very early times of the many well-known plants producing wholesome vegetables, and their gradual development and improvement under cultivation. The seeds of *Cruciferæ* contain a large quantity of fixed oil, for obtaining which certain kinds of *Brassica* such as *sarson*, *tori* and *rai*, are largely grown in India (see under *Brassica*). The following plants belonging to genera not otherwise represented in the plains of India are commonly grown for ornamental purposes :—*Ten-week Stock* (Matthiola annual), *Wallflower* (Cheiranthus Cheiri), and *Candytuft* (Iberis contracta).

Pods long or short, dehiscing throughout their length.

Pods terete, or compressed dorsally (parallel to septum).

Pods narrow, long (sometimes short in *Nasturtium*), cotyledons accumbent.

Pods turgid, seeds in 2 rows . . . 1. NASTURTIUM.

Pods flat, valves elastic, seeds in 1 row . . . . . 2. CARDAMINE.

Pods short and broad, cotyledons accumbent.

Flowers pink, sepals erect, seeds broadly winged. A pubescent undershrub . . . . . 3. FARSETIA.

Flowers yellow, sepals spreading, seeds not winged. A glabrous herb . . . . . 4. COCHLEARIA.

Pods long and narrow, compressed, not beaked; seeds in 1 row, cotyledons incumbent . . . . . 5. SISYMBRIUM.

Pods long or short, beaked; cotyledons folded longitudinally.
Flowers yellow, seeds in 1 row . 6. BRASSICA.
Flowers lilac or yellow veined with purple, seeds in 2 rows . 7. ERUCA.
Pods short, compressed laterally (at rightt angles to septum); cotyledons incumbent.
Pods many-seeded, valves not winged 8. CAPSELLA.
Pods few-seeded, valves winged . 10. LEPIDIUM.
Pods long or short, indehiscent.
Pods broader than long, not beaked 9. SENEBIERA.
Pods elongate, beaked . . . 11. RAPHANUS.

1. NASTURTIUM. R. Br.; Fl. Brit. Ind. i. 133.

Terrestrial or aquatic branching herbs, glabrous or hairy. *Leaves* lobed or pinnatifid, rarely entire. *Flowers* in racemes, small, yellow or white, sometimes bracteate. *Sepals* short, spreading, equal at the base. *Petals* short, scarcely clawed, sometimes wanting. *Stamens* 6, sometimes fewer. *Pods* long or short, almost cylindrical; valves faintly 1-nerved. *Seeds* many, in 2 rows, turgid; cotyledons accumbent.

An aquatic herb with creeping stem and white flowers . . . . . 1. *N. officinale.*
Erect herbs with yellow flowers.
Lobes of leaves toothed . . . . . 2. *N. indicum.*
Lobes of leaves entire . . . . . 3. *N. montanum.*

1. N. officinale. *R. Br. in Ait. Hort. Kew, ed. II, iv, 111; Royle Ill. 70; F. B. I. i. 133; Watt E. D.* (Water-cress.)

Aquatic. *Stems* creeping and floating, much-branched. *Leaves* pinnatifid. *Flowers* white, in short racemes. *Petals* longer than the sepals; limb obovate, spreading. *Pods* ½-1 in. long, stalked, spreading or bent upwards. *Seeds* small, pitted.

Found occasionally in clear streams; common in Dehra Dun and Rohilkhand. DISTRIB.: Punjab, extending through Afghanistan to Europe. On the Himalaya it occurs frequently in a semi-wild state near hill-stations.

2. N. indicum, *DC. Syst. ii, 199; F. B. I. i. 134.* N. madagascariense, *W. & A. Prod. 19.* Sinapis divaricata, *Roxb.; Fl. Ind. iii, 123.*

An erect glabrous or more or less hairy annual. *Stem* 6-12 in., branching from near the base. Radical *leaves* deeply pinnatifid, lobes

usually toothed; upper leaves lyrate, frequently with small auricles. *Racemes* long, many-flowered. *Flowers* small, yellow. *Petals* equalling the sepals. *Pods* ½-¾ in., narrow, cylindrical. *Seeds* many, small, brown, rugose.

Common in damp places. DISTRIB.: Throughout India and in Ceylon, extending to the Malay Archipel., the Philippines, China, and Japan.

3. N. montanum. *Wall. Cat. 4778 (in part); F. B. I. i. 134.* Sinapis pusilla, *Roxb. Fl. Ind. iii, 125.*

An erect branching annual, 1-1½ ft. high. *Stem* slightly villous. Radical *leaves* sinuate-pinnatifid, lobes entire. *Flowers* minute, yellow, bracteate. *Petals* equalling the sepals in length. *Pods* 1-1½ in., narrow, cylindrical. *Seeds* oblong, compressed.

Dehra Dun (Herb. Royle); N. W. Prov. (A. O. Hume). DISTRIB.: Subtrop. Himalaya from the Punjab to Sikkim, the Khasia Hills, and Burma; also in Java, China, and Japan. This resembles *N. indicum*, but is less robust, and has larger smoother less divided leaves.

2. CARDAMINE, Linn.; Fl. Brit. Ind. i. 137.

Annual or perennial often flaccid herbs, glabrous or pubescent. *Leaves* lobed or pinnate, rarely entire, with or without auricles. *Flowers* usually white or lilac. *Sepals* equal at the base. *Petals* clawed. *Pods* narrow-linear, compressed, tapering at both ends; valves with a distinct midrib, opening elastically. *Seeds* in a single row, flattened, not bordered; cotyledons accumbent.

Petioles without auricles . . .	1. *C. hirsuta.*
Petioles with sagittate auricles . .	2. *C. impatiens.*

1. C. hirsuta, *Linn. Sp. Pl. 655,* VAR. sylvatica, *F. B. I. i. 138; Watt E. D.,* C. sylvatica, *Link.* (Bitter-cress.)

A glabrous annual. *Stem* suberect or decumbent, 3-12 in. long. *Petioles* not auricled. *Leaflets* stalked; those of the lower leaves orbicular-ovate, toothed; of the upper narrower and nearly sessile. *Flowers* small, white. *Petals* narrow, erect, twice as long as the very small sepals. *Stamens 6. Pods* ½ in. long, erect, obtuse.

Dehra Dun, and probably in other localities near the hills, flowering during the cold season. DISTRIB.: Bengal; also throughout the temperate parts of the world.

2. C. impatiens, *Linn. Sp. Pl. 655; F. B. I. i. 138.*

An erect annual, 6-12 in. high, nearly glabrous. *Stems* 4-angular. *Petioles* of cauline leaves with sagittate auricles. *Leaflets* shortly stalked, ovate-oblong or lanceolate, more or less lobed, minutely ciliate on the margins. *Flowers* small, white. *Petals* linear, erect, often wanting. *Pods* 1 in., erect, slender, acute; *style* subulate.

Dehra Dun. DISTRIB.: Himalayan ranges, up to 12,000 ft., extending through Afghanistan to Europe.

3. FARSETIA, Desv.; Fl. Brit. Ind. i. 140.

Hoary or tomentose much-branched rigid undershrubs. *Leaves* small, linear-oblong, entire. *Flowers* white pink or yellow, in spicate racemes. *Sepals* erect, connivent, lateral saccate at the base. *Petals* with long claws. *Pods* sessile, linear or elliptic-oblong, much flattened, valves convex. *Seeds* 1-2-seriate, suborbicular, broadly winged; cotyledons accumbent.

F. Hamiltonii, *Royle Ill. 71; F.B.I. i, 140; Watt E.D.* Arabis incanescens, *Munro Hort. Agrensis* 6.

Branches long, erect. *Leaves* narrowly linear. *Flowers* small. *Sepals* obtuse, strigose, with scarious margins. *Petals* obovate, a little longer than the sepals, pink. *Pods* ½-1 in. long, linear, valves almost nerveless. *Style* slender. *Seeds* in one row.

Banks of the Jumna between Delhi and Agra. DISTRIB.: Punjab, and westward to Afghanistan, Arabia and Algeria. Munro, who found it at Agra, considered it to be an introduction.

4. COCHLEARIA, Linn.; Fl. Brit. Ind. i. 145.

Glabrous, often fleshy, annual or perennial herbs. *Leaves* pinnatifid or toothed, rarely entire. *Flowers* yellow, lilac or white, in racemes, rarely solitary. *Sepals* spreading, equal at the base. *Petals* entire, shortly clawed. *Filaments* without appendages or teeth. *Pods* globose ovoid or oblong, valves turgid. *Seeds* usually 2-seriate, compressed, without wings; cotyledons accumbent.

C. Armoracia, L. (the common Horse-radish) is occasionally cultivated in European gardens of Upper India.

C. flava, *Buch.-Ham. ex Roxb. Hort. Beng. 48; Royle Ill. 72; F. B. I. i, 145.*

An erect, rarely depressed, diffusely branched glabrous annual, about 1 ft. in height. *Root* long, fusiform. *Leaves* 4-5 in., lanceolate, pinnatifid; lower stalked; upper smaller and auricled; lobes sinuate-toothed. *Racemes* numerous. *Flowers* small, yellow. *Pods* globose, smooth; valves without nerves. *Style* short, thick. *Seeds* many, rugose, with filiform funicles.

On river banks, and in damp places. DISTRIB.: Eastward to Bengal, and westward to the Punjab.

5. SISYMBRIUM, Linn.; Fl. Brit. Ind. i, 147.

Glabrous or more or less hairy or hispid annuals or perennials. *Leaves* entire or toothed. *Flowers* white yellow or purplish, in lax sometimes bracteate racemes. *Petals* with long claws. *Pods* elongate, cylindric or compressed; valves convex, 1-3 nerved, *style* short, *stigma* 2-lobed. *Seeds* 1-seriate, not margined, with filiform cords; cotyledons incumbent.

Flowers white, valves of pod 1-nerved	1. *S. Thalianum.*
Flowers yellow, valves of pod 3-nerved.	
Fruiting pedicels as broad as the pod	2. *S. orientale.*
Fruiting pedicels slender	3. *S. Irio.*

1. S. Thalianum, *J. Gay in Ann. Sc. Nat. Ser. I, vii, 399; F. B. I. i, 145.* (Thale-cress.)

An erect slender branching annual, 4-12 in. high, hispid with spreading simple or forked hairs, or glabrous. Radical *leaves* stalked, obovate, 1-3 in., entire or slightly toothed; cauline few, remote, sessile, generally entire. *Racemes* slender, elongate. *Flowers* small, white; pedicels spreading or ascending, very slender. *Pods* ½-1 in., narrow, linear, glabrous, compressed; valves convex, 1-nerved. *Style* short. *Seeds* very small, flattened; cotyledons obliquely incumbent.

A common cold-weather annual. DISTRIB.: Plains of Upper India; Himalaya, from Kashmir to Bhutan, up to 10,000 ft.; extending to Abyssinia and Europe.

2. S. orientale, *Linn. Cent. Pl. II, 24.* S. Columnæ, *Jacq*; *F. B. I. i. 150.*

A tall annual, up to 3 ft. high. *Stem* stout, erect, slightly branching, hispid with spreading or reflexed hairs, or glabrous and glaucous. *Leaves* runcinate, or sometimes entire; segments toothed, ovate-oblong to lanceolate; terminal lobe angled, of the upper leaves hastate. *Flowers* large, pale yellow. *Sepals* erect, glabrous. *Pods* 3-4 in., spreading, very slender, curved, glabrous or slightly hairy; pedicels very stout; valves 3-nerved. *Style* thick.

Dehra Dun. DISTRIB.: Kashmir to Kumaon up to 10,000 ft.; W. Tibet up to 14,000 ft.; westward to Europe.

3. S. Irio, *Linn. Sp. Pl. 659; F. B. I. i. 150; Watt E. D.* Vern. *Parjan* (Merwara). (London Rocket.)

Annual or biennial. *Stem* 1-3 ft., glabrous or slightly pubescent below. *Leaves* stalked, runcinate or pinnatifid; lobes not auricled, remote, spreading, toothed; terminal large, sometimes hastate. *Flowers* minute, yellow; pedicels slender. *Pods* 1½-2 in., overtopping the raceme when young, slender, erect, glabrous, subtorulose; valves 3-nerved; pedicels ascending, curved. *Stigma* sessile.

Merwara, in cultivated ground. DISTRIB.: Rajputana and Punjab, extending through Afghanistan to Europe and the Canary Islands.

6. BRASSICA, Linn. ; Fl. Brit. Ind. i. 155.

Glabrous or hispid annual biennial or perennial herbs. *Rootstock* often woody. Lower *leaves* usually pinnatifid or lyrate, the upper often entire. *Flowers* in racemes, yellow. *Sepals* erect or spreading, lateral usually saccate at the base. *Pod* elongate, cylindric or somewhat compressed, often with an indehiscent 1-seeded beak extending beyond the valves. *Seeds* globose, ovoid or flattened; *cotyledons* incumbent.

A very important genus, containing all the different varieties of cabbage and cauliflower, the colzas, rapes, turnips and mustards.*

Pods erect, nearly glabrous, appressed to the axis of the raceme	1. *B. nigra.*
Pods more or less spreading—	
Pods hairy, shorter than the flat beak	2. *B. alba.*
Pods smooth, longer than the slender conical beak—	
Stem-leaves tapering to the base, not amplexicaul.	
Stems not elongating in early growth; leaves green, those at the base persisting to form a loose cabbage, cauline leaves not lyrately lobed	3. *B. rugosa.*
Stems elongating from the commencement of growth; basal leaves quickly withering, those of the stem mostly lyrately lobed .	4. *B. juncea.*
Stem-leaves broad-based, the upper ones amplexicaul.	
Leaves hairy when young, glaucous on both surfaces; pods usually stout	5. *B. campestris*, *var. Sarson.*

* For a clear understanding of the various cultivated forms of each of the above-mentioned groups as affecting the relation to them of the different kinds of mustard cultivated in Upper India, the reader is referred to Dr. Prain's exhaustive report on the cultivated mustards of Bengal, published in Bulletin No. 4 (1898) of the Department of Land Records and Agriculture, Bengal.

Leaves always glabrous, green above glaucescent beneath; pods rather slender	6. *B. Napus, var. dichotoma.*
Leaves mostly in radical rosettes, green, hispid	7. *B. Tournefortii.*

1. B. nigra, *Koch in Roehl. Deutschl. Fl. ed. III, iv., 713; F. B. I. i. 156.*

This is the 'Black Mustard' of commerce, the powdered husked seeds of which form the chief ingredient of ordinary English mustard. It is sparingly cultivated in Upper India as a garden crop. In the Central Provinces it is occasionally grown as a subordinate field-crop with flax, and is known there under the vernacular name "Tikki."

2. B. alba. *Boiss. Voy. Espagne ii, 39; F. B. I. i. 157; Watt E. D.* Sinapis, alba *L.* (White Mustard).

Rarely cultivated in native gardens. Mostly used by Europeans as a salad along with cress. The seed is used for the same purpose as that of the preceding.

3. B. rugosa, *Prain in Bull. No. 4. (1898), Department of Land Records and Agriculture, Bengal, 11.* B. juncea, *Hk. f. & T.; F. B. I. i, 157 (in part).* B. chinensis, *Duthie and Fuller Field & Gard. Crops ii, 84 (not of Linn).* Sinapis rugosa, *Roxb.; Fl. Ind. iii, 122.* Vern. *Badshahi-lai, chotiya-lai* (Sub-Himalayan tracts.)

Stem short in early growth, bearing a number of persistent radical leaves, which form a loose cabbage-like head, afterwards elongating in branches up to 6 feet. Lower *leaves* very large, obovate, obtuse or subacute, tapering into the stalk, thick and pale-coloured; veins fan-like, spreading beyond the stout midrib; stem-leaves similar but smaller, sessile, not amplexicaul. *Sepals* slightly spreading. *Corolla* a little over ½ in. across; *petals* bright yellow, with a pale green narrow claw. *Pods* 1¼-1½ in. long; beak narrowly conical, ¼ in. long; valves faintly beaded opposite the seeds, midrib prominent outside. *Seeds* 7-10 under each valve, brown, finely rugose.

Cultivated during the cold season in the Sub-Himalayan districts of Kumaon and N. Oudh; also in Nepal and eastward to British Bhutan. Dr. Prain remarks that on the hills it is an early cold-weather crop, and that it is grown more for the leaves than for the seeds.

4. B. juncea. *Hk. f. & T. Journ. Linn. Soc. V. 170 (in part); F. B. I. i. 157 (in part); Duthie and Fuller Field & Gard. Crops ii, 33, t. xli; Watt E. D.* Sinapis juncea, *Linn.* S. ramosa, *Roxb.; Fl. Ind. iii, 119.* S. patens, *Roxb.; Fl. Ind. iii, 124* (B. juncea, *var.* agrestis, *Prain*). Vern. *Rai, barlai.* (Indian Mustard.)

A tall erect branching annual, 3-6 ft. high. *Stems* often tinged with purple, especially at the joints. *Leaves* green, sometimes hispid beneath; the lower ones stalked, their blades 6-8 in. long, pinnatifid or sinuate-lyrate; the upper decreasing in size, with entire margins. *Flowers* bright

yellow, in short corymbs, elongating into racemes 8 in. in length; pedicels slightly spreading. *Sepals* spreading. *Corolla* a little over ¼ in. across; *claw* pale green. *Pods* 1½-2½ in. long, ⅛ in. thick, torulose *beak* narrowly conical, nearly ¼ in. long. *Seeds* many, globose, brown, finely rugose.

Largely grown during the cold-weather months throughout the area, sometimes as a subordinate crop in fields of wheat, barley and peas, more often restricted to the borders of such fields. This plant varies to some extent as to height, and in the presence or absence of hairs on the under surface of the leaves. The oil yielded by the seeds is chiefly used as an article of food.

5. B. campestris, *Linn.*, VAR. Sarson, *Prain in Bull. No. 4, (1898) Department of Land Records and Agriculture. Bengal, 24.* B. campestris, *subsp.* Napus, *Hk. f. & T.; F B. I. i., 156 (in part).* B. campestris, *subsp.* Napus, *vars.* glauca trilocularis *and* gaudrivalvis, *Duthie and Fuller Field & Gard. Crops ii, 28 and 29, t.t. xxxvii. to xxxix.* B. trilocularis *and* guadrivalvis, *Hk. f. & T.; F. B. I. l.c.* B. campestris, *var* glauca, *Watt E. D.* Sinapis glauca, *Roxb. Fl. Ind. iii, 118.* S. trilocularis, *Roxb. l c. 121.* Vern. *Sarson, banga sarson* (Meerut and Dehra Dun), *pila sarson* (Oudh and Rohilkhand). (Indian Colza.)

A tall annual, 4-5 ft. high. *Stems* simple or branching. *Leaves* large; the lower lyrately pinnatipartite, 6-8 in. long; upper smaller, oblong and from lyrate-sinuate to lanceolate, all except the lowest auricled, glaucous and more or less hairy beneath at first. *Flowers* in oblong corymbs, elongating into racemes. *Sepals* suberect, the inner pair longer than the outer, glaucous, turning yellow before falling. *Corolla* nearly 1 in. across; *petals* and their claws bright yellow. *Pods* various, 2-3½ in. long including beak, normally 2-valved and 2-celled, or spuriously 3-4-valved, erect or pendent, beak conical, stout, often 1 in. long. *Seeds* 30-80 in a pod, subglobose, dingy-white yellow or brown, nearly smooth.

Very largely grown during the cold season, especially in the Doab districts. Usually sown in parallel lines with wheat and barley. The oil (*karwa tel*) yielded by the seeds forms an important ingredient in Indian cookery, and is also much used for lighting purposes.

6. B. Napus, *Linn. Sp. Pl. 666,* VAR. dichotoma, *Prain l.c. 36. B.* campestris, *subsp.* Napus, *Hk. f. & T.; F. B. I. i, 156 (in part). B.* campestris, *subsp.* Napus, *vars.* dichotoma *and* Toria, *Duthie and Fuller Field & Gard. Crops. ii, 29, t.t. xl and xla. B. campestris, subsp.* campestris, *var.* dichotoma, *Watt E.D.* Sinapis dichotoma, *Roxb.; Fl. Ind. iii, 117.* Vern. *Tori, kâli sarson.* (Indian Rape).

An annual 1-4 ft. high. Branches many, slender, spreading. *Leaves* small, the lower not exceeding 4 in. long and 2 in. wide, lyrate, pale green or glaucescent, almost glabrous, those above the basal ones auricled; upper 1-2 in. long, triangular-lanceolate, subobtuse, with large stem-clasping auricles at the base, margins entire. *Flowers* in short corymbs elongating into racemes. *Sepals* spreading, green, and turning yellow before falling. *Corolla* exceeding ¼ in. in diam., bright yellow; petals with a pale green narrow claw. *Pods* ascending, 2-valved,

2-2½ in. including the narrowly conical beak, torulose before fully ripe; valves very convex. *Seeds* about 20 in each pod, bright brown, finely rugose.

The cultivation of this mustard is chiefly confined to the Sub-Himalayan districts, where it is usually grown alone. In the Doab it is cultivated generally as a subordinate crop in native vegetable gardens mixed with carrots and other minor crops. There are two rather distinct forms; a tall later kind, 2-4 ft. high, is the *var. dichotoma* of F. & G. Crops t. xl; the other, a dwarf and earlier kind, is the *var. Toria* of F. & G. Crops t. xla. The latter is largely grown on the Himalaya, and up to considerable elevations.

7. B. Tournefortii, *Gouan Ill. 44, t. 22, f. A; Boiss. Fl. Or. i. 393; F. B. I. i. 156; Watt E. D.* B. Stocksii, *Hk. f. & T.*

An erect, branching, hispid or glabrate annual, about 1 ft. in height. Radical *leaves* forming a rosette, petioled, runcinate-lyrate, hispid with white hairs; lobes toothed; cauline pinnatifid or linear-lanceolate and entire. *Flowers* small, pale yellow. *Pods* 2½ in., erect, slender, glabrous, compressed, torulose; beak ¾ in., slender, tapering, usually 1-seeded. *Seeds* compressed.

Between Ajmir and Delhi (Jacquemont). DISTRIB.: Punjab, W. Tibet; westwards to Spain and Italy. A very local species.

7. ERUCA, Tourn.; Fl. Brit. Ind. i. 158.

Erect branching herbs. *Flowers* large, lilac, or yellowish veined with violet. *Sepals* erect, lateral saccate at the base. *Pods* closely appressed to the stem, ovoid-oblong, turgid, terete, with a large ensiform seedless beak; valves concave, 3-nerved. *Stigma* simple. *Seeds* many, in two rows, globose; cotyledons folded longitudinally. —Species about 12, natives of South Europe, North Africa and West Asia.

E. sativa, *Mill. Gard. Dict. ed. viii, n. 1, F. B. I. i. 158; Field & Gard. Crops, ii. 26, t. xxvi; Watt E. D.* Brassica erucoides, *Roxb.; Fl. Ind. iii, 117.* Vern. *Duan, tira, taramira.*

An erect branching herb, upwards of 2 ft. in height. *Stem* terete, hispid below with reflexed hairs. *Leaves* lyrate-pinnatifid, dark green or glaucous; lower up to 8 in., on long stalks, lobed or subentire; intermediate deeply pinnatifid, with a broadly ovate or oblanceolate terminal lobe; petioles with winged margins. *Flowers* large, greenish-yellow, often veined with purple. *Calyx* 4-angular, twice as long as the pedicels. *Sepals* erect, lateral ones gibbous at the base. *Pods* about 1 in. long, ovoid-oblong, turgid, smooth, its flat beak ½ the length of the valves. *Seeds* compressed, reddish-brown.

A cold-season crop, chiefly in the Western districts of the area. It is said to be indigenous in S. Europe, N. Africa and in W. Asia. It

is usually sown along with other crops, such as gram and barley, and sometimes in cotton fields. The oil from the seeds is used chiefly for burning.

8. CAPSELLA, Mœnch. ; Fl. Brit. Ind. i. 159.

Small branching annuals or perennials. Radical *leaves* entire or pinnatifid. *Flowers* in racemes, small, white. *Sepals* spreading, equal at the base. *Pods* obcordate-cuneate, ovate or oblong, laterally compressed; valves boat-shaped, septum very narrow. *Style* short. *Seeds* many, in 2 rows; cotyledons incumbent. Natives chiefly of N. and S. Temp. regions.

C. Bursa-pastoris, *Medic. Pflanzeng. 85; W. & A. Prod. 20; F. B. I. i. 159* ; *Watt E. D.* (Shepherd's Purse.)

Glabrous or hairy, hairs branched. *Root* long, tapering. *Stems* 6-16 in. *Radical leaves* rosulate, pinnatifid, upper lobe triangular; cauline auricled. *Flowers* $\frac{1}{10}$ in. in diam. *Pods* $\frac{1}{4}$-$\frac{1}{3}$ in. long, triangular or obcordate; valves smooth. *Seeds* oblong, punctate.

A common weed of cultivation during the cold season. DISTRIB.: Abundant on the Himalaya up to 10,000 ft. ; widely diffused in arctic and temp. regions of the world.

9. SENEBIERA, DC.

Annual or biennial branching prostrate herbs. *Leaves* entire or cut. *Flowers* minute, white, in short leaf-opposed racemes. *Sepals* short, spreading. *Stamens* often only 2 or 4. *Pods* small, indehiscent, didymous, laterally compressed; valves subglobose, rugose or crested; *stigma* nearly sessile. *Seeds* 1 in each cell; cotyledons incumbent or induplicate.

S. pinnatifida, *DC. in Mem. Soc. Hist. Nat. Par. 144, t. 9.* S. didyma, *Pers.* (Lesser Wart-cress).

Annual, slightly hispid. *Leaves* finely cut, 1-2 pinnatifid; lobes small, obovate, spreading. *Flowers* usually apetalous and 2-androus. *Pod* $\frac{1}{12}$ in. broad, separating into 2 indehiscent transversely reticulate lobes; pedicels spreading. *Seeds* reniform, punctate-striate.

An established weed of cultivation during the cold season. DISTRIB.: Bengal and Punjab. Introduced within recent times. Not mentioned by Roxburgh nor included in the F. B. I. Believed to be a native of Trop. America.

10. LEPIDIUM, Linn.; Fl. Brit. Ind. i. 159.

Erect or diffuse herbs or shrubs with entire or divided leaves. *Flowers* small, white, ebracteate. *Sepals* short, equal at the base.

Petals short or 0. *Pods* ovate, oblong or orbicular, laterally much compressed, tips notched or entire; valves boat-shaped, keeled or winged. *Seeds* solitary in each cell. *Cotyledons* incumbent.

L. sativum, *Linn. Sp. Pl. 644; Roxb. Fl. Ind. iii, 116; Royle Ill 70; F. B. I. i, 159; A.DC. L'Orig. Pl. Cult. 68; Watt E. D.; Field & Gard. Crops iii, 49.* Vern. *Hálim.* (Garden Cress.)

A glabrous erect annual, 6-18 in. high. Radical *leaves* long-petioled, 2-pinnatisect; cauline sessile, often entire. *Flowers* in long racemes, small, white, ebracteate. *Sepals* short, equal at the base. *Pods* orbicular-ovate, deeply notched, wings narrow.

Cultivated in the plains as a cold-weather garden crop. Though often met with as an escape, it is not indigenous in India. DeCandolle regarded it as a native of Persia, and to have spread thence into India. The seeds are used medicinally, and the leaves are eaten raw.

11. RAPHANUS, Linn.; Fl. Brit. Ind. i. 166.

Coarse rough or glabrous annuals or biennials. *Leaves* lyrate. *Flowers* large, in long ebracteate racemes. *Sepals* erect, lateral saccate at the base. *Pods* indehiscent, elongate, coriaceous, constricted or continuous within, or filled with pith separating the seeds. *Seeds* pendulous, globose; cotyledons conduplicate.—Species about 6, natives of Europe and Temp. Asia.

R. sativus, *Linn. Sp. Pl. 669; Roxb. Fl. Ind. iii, 126. F. B. I. i, 166; F. & G. Crops, N. W. Prov. & Oudh, iii, 14, t. xciv; Watt E. D.; A.DC. L'Orig. Pl. Cult. 23.* Vern. *Muli.* (Radish.)

Root fleshy, variable in size and form. *Leaves* roughly pilose. *Flowers* white, or lilac with purple veins. *Pods* terete.

Largely cultivated in the plains during the cold season, also on the Himalaya. The special form, as grown in native gardens, is remarkable for the extraordinary size of the so-called roots attaining sometimes, as Roxburgh mentions, to that of a man's leg. According to DeCandolle and others the English radish is believed to have originated from *R. Raphanistrum*, L., which is wild in Europe. The Indian plant, in regard to its almost tropical habit, may, as Dr. Watt suggests, have come into India from the direction of China and Japan, in which countries the radish has been cultivated for many centuries.

IX.—CAPPARIDEÆ.

HERBS shrubs or trees, erect or climbing. *Leaves* simple or palmately 3-9-foliolate. *Stipules* 2 or 0, sometimes spinescent. *Inflorescence* indefinite. *Flowers* regular or irregular, usually 2-sexual.

Sepals 4, free or connate, valvate or imbricate, rarely open in bud. *Petals* 4, rarely 2 or 0, hypogynous or seated on a disk, imbricate or open in bud. *Stamens* 4 or more, hypogynous or perigynous, or at the base of or on a long or short gynophore. *Ovary* sessile or stalked, 1-celled. *Style* short or 0. *Stigma* depressed or capitate. *Ovules* indefinite, on 2-4 parietal placentas. *Fruit* capsular or a berry. *Seeds* exalbuminous.—Chiefly tropical.

Herbs, fruit capsular.

Stamens sessile on the disk, petals imbricate in bud . . . . . 1. CLEOME.

Stamens on the gynophore, petals open in bud . . . . . 2. GYNANDROPSIS.

Shrubs or trees, fruit a berry.

Sepals combined at the base, fruit moniliform . . . . . 3. MÆRUA.

Sepals distinct.

Sepals distant, inserted on the edge of an expanded disk . . . . 4. CRATÆVA.

Sepals biseriate, stipules spinescent . 5. CAPPARIS.

1. CLEOME, Linn.; Fl. Brit. Ind. i. 168.

Herbs. *Leaves* simple or digitately 3-9-foliolate. *Flowers* in racemes. *Sepals* 4, spreading. *Petals* 4. *Stamens* 4 to many, sessile on the disk. *Ovary* sessile or sub-sessile. *Style* short or 0. *Ovules* many, on 2 parietal placentas. *Capsule* oblong or linear; valves 2, separating from the seed-bearing placentas. *Seeds* reniform.—Chiefly tropical.

Leaves simple . . . . . 1. *C. simplicifolia.*

Leaves compound—

Stamens 6 . . . . . 2. *C. brachycarpa.*

Stamens 12 or more—

Capsule glandular-pubescent . . 3. *C. viscosa.*

Capsule glabrous . . . . 4. *C. Chelidonii.*

1. C. simplicifolia, *Hk. f. & T. in F. B. I. i, 169.* Polanisia simplicifolia, *Camb. in Jacquem. Voy. Bot. 20, t. 20; D. & G. Bomb. Fl. 8.* C. burtporensis, *Munro.*

A prostrate strigose branching annual. *Leaves* simple, 1-2 in. long, obovate-oblong or lanceolate, obtuse or acute, scaberulous, the hairs with scale-like bases. *Flowers* ½ in., violet. *Bracts* leafy. *Stamens* 10-12. *Capsule* ¾-1¼ in., subsessile, torulose; beak ⅛ in. *Seeds* large, brown, smooth.

Bhurtpore (Munro), Gwalior (Maries). DISTRIB.: Drier parts of the Deccan and Konkan.

2. C. brachycarpa, *Vahl ex DC. Prod. i, 240; F. B. I. i. 169.* C. Ruta, *Camb. in Jacquem. Voy. Bot. 19, t. 19.*

A musky-scented glandular rough perennial herb, 6-16 in. high, branching from the base. *Leaves* 3-5-foliolate, upper simple, stalked; leaflets ¼-½ in. long, obovate or oblong. *Flowers* in leafy racemes, ¼-½ in. long, long-pedicelled, yellow. *Stamens* 6. *Capsule* ½ in., oblong, scaberulous. *Seeds* minute, smooth.

Between Delhi and Agra, (Jacquemont). DISTRIB.: Punjab Plain and Sindh, westward to Arabia and Abyssinia.

3. C. viscosa, *Linn. Sp. Pl. 672; Roxb. Fl. Ind. iii. 128; F. B. I. i. 170; Watt E. D.* Polanisia viscosa, *DC.; Royle Ill. 73.* Polanisia icosandra, *W. & A. Prod. 22.* Vern. *Hulhul.*

An erect glandular-pubescent annual, 1-3 ft. high. *Leaves* 3-5-foliolate; leaflets sessile, ovate or obovate. *Flowers* on long pedicels, ½ in. long, yellow. *Sepals* ovate, acute. *Petals* 4, 2 approximate and 2 spreading, obtuse, clawed. *Stamens* 12-24. *Capsule* 2-3½ in., narrowed upwards, striate, gland-pubescent, style glabrous. *Seeds* small, granular, black.

A common weed, especially in cultivated ground, flowering during the rainy season. DISTRIB.: Warmer parts of India, and throughout the tropical regions of the world. The pungent seeds are often used by the natives in their curries; they are also valued medicinally as well as the leaves.

4. C. Chelidonii. *Linn. f. Suppl. 300; Roxb. Fl. Ind., iii. 127; F. B. I. i. 170.* Polanisia Chelidonii, *DC.; W. & A. Prod. 22; Royle Ill. 73; D. & G. Bomb. Fl. 8.*

An erect much-branched annual, 1-3 ft. high, glabrous or sparsely scabrid. *Leaves* 5-9-foliolate, long-petioled; leaflets obovate or oblong. *Flowers* in racemes, afterwards corymbose, long-pedicelled, ¾-1 in. in diam., regular, pink. *Petals* sessile, ovate. *Stamens* very many. *Capsule* 2-4 in., slender, tapering at both ends, glabrous. *Seeds* rather large, pale brown, muricate.

Bundlekhand (Edgeworth), in moist places. DISTRIB.: Central and S. India; Java. The seeds of this species are also used in curries.

2. GYNANDROPSIS, DC.; Fl. Brit. Ind. i. 170.

Glandular-pubescent or glabrous annuals. *Leaves* 3-7-foliolate. *Racemes* leafy. *Sepals* 4. *Petals* 4, spreading, with long claws. *Stamens* 6, filaments adnate below to the slender gynophore. *Ovary* stalked; *ovules* many. *Capsule* elongate, narrowly stalked; valves 2, separating from the seed-bearing placentas. *Seeds* reniform or orbicular. This genus differs from *Cleome* chiefly by having the stamens separated from the petals by a long internode.

G. pentaphylla, *DC. Prod. i, 238; W. & A. Prod. 21; Royle Ill. 72; D. & G. Bomb. Fl. 7; F. B. I. i. 171; Watt E. D.* Cleome pentaphylla *L.; Roxb. Fl. Ind. iii, 126.* Vern. *Hulhul.*

Erect, branching, gland-pubescent, 1-3 ft. high. *Leaves* 5-foliolate; leaflets 1-2 in. sessile, broadly obovate, acute or obtuse, entire or serrulate. *Flowers* in corymbs, ½-¾ in. in diam., white or purplish, very viscid. *Bracts* 3-foliolate. *Sepals* erect. *Capsule* 2-4 in., rarely glabrous, striated. *Stigma* sessile, capitate.

Abundant within the area, flowering during the rainy season. DISTRIB.: A common weed in all tropical countries. The leaves are eaten as a pot-herb; the seeds are medicinal, and are said to be used also for poisoning fish.

3. MÆRUA. Forsk.; Fl. Brit. Ind. i. 171.

Climbing shrubs. *Leaves* simple. *Flowers* in corymbs. *Calyx*-tube lined by a disk; lobes 4, valvate. *Petals* 4 or 0, smaller than the calyx-lobes, ovate, inserted on the edge of the disk. *Stamens* many, inserted high up on the gynophore; filaments exserted. *Ovary* long, stalked, 1-celled, or 2-celled by the cohesion of the placentas. *Berry* fleshy, elongate, moniliform, 1-or more-seeded.—Tropical Asia and Africa.

M. arenaria, *Hk. f. & T. in F. B. I. i, 171.*

A large woody glabrous or pubescent climber. *Leaves* ½-3 *in.*, broadly ovate, acute, obtuse or retuse. *Corymbs* terminal or on lateral shoots. *Flowers* ½-1 in. long, white. *Calyx*-tube dilated upwards, half the length of the limb. *Berry* 2-5 in. long, deeply constricted between the seeds.

VAR. 1. glabra *F. B. I. l.c.*; Nieburhia arenaria & oblongifolia, *DC.; W. & A. Prod. 24 (in part).* Capparis heteroclita, *Roxb. Fl. Ind. ii, 570*: glabrous and glaucous except the margins of the cal.-lobes.—Gwalior, Bundelkhand. DISTRIB.: Punjab, Central and S. India, and Ceylon. Roxburgh says that the unripe fruit is boiled and eaten.

VAR. 2. scabra, *F. B. I. l.c.* M. scabra & ovalifolia, *Camb. in Jacquem. Voy. Bot. 23 t.t. 23 and 24.* Nieburhia oblongifolia, *Royle Ill. 73*: young shoots and upper leaves scabrous; calyx softly pubescent.—In the neighbourhood of Agra and Delhi, also in Merwára. DISTRIB.: Punjab.

4. CRATÆVA, Linn.; Fl. Brit. Ind. i. 172.

Trees. *Leaves* 3-foliolate. *Flowers* large, yellow or purplish, polygamous. *Sepals* 4, inserted on the edge of a large lobed disk. *Petals* 4, long-clawed, open in bud. *Stamens* many, adnate to the base of the gynophore. *Ovary* on a slender stalk, 1-celled. *Stigma* sessile, depressed. *Ovules* many, on 2 parietal placentas. *Berry* fleshy. *Seeds* imbedded in pulp.

C. religiosa. *Forst. f. Prod. 35; Royle Ill. 72; F. B. I. i. 172; Brand. For. Fl. 16; Watt E. D.* Capparis trifoliata, *Roxb. Fl. Ind. ii. 571.* Vern. *Brarna, bilási, bárna (Saharanpur).*

A small spreading unarmed tree. *Leaves* deciduous, appearing with the flowers, long-petioled; leaflets 3-6 in. long, ovate or ovate-lanceolate, acuminate, entire, glabrous, pale beneath. *Flowers* 2 in. in diam., in corymbose clusters at the ends of the new growths, greenish-yellow, at length purplish. *Petals* ovate or oblong, obtuse or acute; claw half as long as the limb. *Stamens* longer than the petals. *Berry* 1-2 in., on a thickened woody gynophore; pericarp hard, marked with white specks. *Seeds* nearly smooth, black.

Occurs generally as a planted tree within the area, flowering in April and May. It may, however, be truly wild on the Siwalik range, as supposed by Edgeworth. It is believed to be indigenous in Malabar and Kanara, but planted in other parts of India and in Ceylon. The bark and leaves are used medicinally, and the viscid pulp of the fruit is sometimes mixed with mortar to form a strong cement. In the Fl. Brit. Ind. the following two varieties are mentioned:—

VAR. 1. Nurvala, *Buch.-Ham. (sp.); W. & A. Prod. 23; D. & G. Bomb. Fl. 8;* leaflets ovate-lanceolate, taper-pointed; berry ovoid.

VAR. 2. Roxburghii, *R. Br. (sp.); W. & A. Prod. 23; D. & G. Bomb. Fl. 8;* leaflets small, ovate-lanceolate, abruptly acuminate; berry globose. This is the variety usually met with in Upper India.

5. CAPPARIS, Linn.; Fl. Brit. Ind. i. 173.

Small trees or climbing shrubs, usually armed with a pair of stipular thorns at the base of the petioles. *Leaves* simple, rarely 0. *Flowers* often showy. *Sepals* 4, free, in 2 series. *Petals* 4, sessile, imbricate. *Stamens* many, inserted on the disk at the base of the long gynophore. *Ovary* stalked, 1-4-celled. *Stigma* sessile. *Ovules* many, on 2-6 parietal placentas. *Fruit* fleshy, rarely bursting by valves. *Seeds* many, imbedded in pulp.

Capparis spinosa, L., the 'Caper plant' of commerce, is found wild in hot valleys of the Himalaya, also in the Punjab, Sindh and other parts of India, but not within the area of this flora.

A dense shrub or small tree with reddish-brown or scarlet flowers in corymbs . .	1. *C. aphylla.*
A small tree with white flowers in terminal corymbs or racemes	2. *C. grandis.*
Climbing shrubs with white or purplish flowers.	
Flowers in simple umbel-like corymbs, white	3. *C. sepiaria.*
Flowers supra-axillary in a vertical line, white or purplish	4. *C. horrida.*

1. C. aphylla, *Roth Sp. Pl. Nov. 233; W. & A. Prod, 27; Royle Ill. 72; D. & G. Bomb. Fl. 9; Brand. For. Fl. 14 & 571; F. B. I. i. 174. Watt E. D.* Vern. *Karil.*

A much-branched glabrous shrub or small tree. *Branches* slender; thorns in pairs, straight. *Leaves* on young shoots only, ¼ to ½ in. long, linear, caducous, pungent. *Buds* pubescent. *Flowers* 1 in. in diam., red-brown or scarlet, in many-flowered corymbs on short lateral shoots. *Sepals* unequal, inner saccate. *Petals* ovate, longer than the sepals. *Stamens* 18-20, filaments long; gynophore slender, as long as the stamens. *Fruit* ½-¾ in., globose or ovoid, red when ripe, glabrous.

Abundant in the drier portions of the area, associated with *Salvadora, Acacia leucophlœa* and other desert shrubs. DISTRIB.: Punjab, Rajputana, C. India and the Deccan, extending westward to Arabia, Nubia and Egypt. The new leaves on young shoots appear from November to March, flowers in March and April. The flower-buds (*pasi*) and young fruit are cooked and eaten as a pot-herb and also preserved as a pickle. The ripe fruit is also pickled.

2. C. grandis, *Linn. f. Suppl. 263; W. & A. Prod. 27 (in part); D. & G. Bomb. Fl. 10; F. B. I. i. 176; Watt E. D.* C. bisperma, *Roxb. Fl. Ind. ii 568; W. & A. Prod. 26 (in part).*

A small tree with pubescent branches. *Thorns* 0, or recurved. *Leaves* 2-3 in. long, broadly ovate or obovate, acute obtuse or retuse, silky beneath. *Buds* pubescent. *Flowers* ¾-1 in. in diam., white, in terminal corymbs or racemes. *Petals* narrowly obovate. *Ovary* glabrous. *Fruit* the size of a nutmeg, subglobose, purple, smooth, 2-6-seeded.

Merwara. DISTRIB.: Rajputana and southward to Ceylon. Roxburgh describes his *C. bisperma* as a timber tree.

3. C. sepiaria, *Linn. Syst. ed. X, 1071; Roxb. Fl. Ind. ii. 568; W. & A. Prod. 26; Camb. in Jacquem. Voy. Bot. t. 22; D. & G. Bomb. Fl. 10; Brand. For. Fl. 15; F. B. I. i. 177; Watt E. D.*

A moderate-sized spreading shrub, sometimes climbing. Young parts hoary or tomentose. *Branches* numerous, tough and wiry; thorns recurved. *Leaves* ¾-1½ in. long, ovate oblong or oblong-lanceolate, sub-acute or retuse, penninerved, smooth above, downy beneath. *Flowers* ½-¾ in. in diam., white, in many-flowered umbels; pedicels filiform. *Sepals* oval, concave. *Petals* oblong, unequal. *Stamens* exceeding the petals *Ovary* ovoid, pointed, glabrous; gynophore ¼-½ in. *Berry* ½ in. in diam. 1-seeded, black when ripe.

Dry places, common; flowers in May, fruit ripens in July. DISTRIB.: Throughout India, extending to the Philippines. An excellent plant for hedges, and easily raised from seed or cuttings.

4. C. horrida, *Linn. f. Suppl. 264; W. & A. Prod. 26; D. & G. Bomb. Fl. 10; Brand. For. Fl. 15; F. B. I. i. 178. Watt E. D.* Vern. *His, karralura* (Oudh).

A climbing shrub. Young parts clothed with dense ferruginous pubescence. *Thorns* recurved, laterally compressed. *Leaves* 1½-4 in. long, ovate obovate or oblong, obtuse acute or mucronate, at length shining

above, usually much reticulate. *Flowers* 1½-2 in. across, white, afterwards rose-coloured or purplish; pedicels supra-axillary, solitary or 2-4 above one another in a vertical line. *Petals* oblong, ciliate, shorter than the stamens. *Filaments* purple. *Ovary* acute, glabrous; gynophore as long as the stamens. *Fruit* 1-1½ in. in diam., on a stout gynophore, subglobose, reddish-brown, many-seeded.

Common in hedges and in scrub forest, and often climbing over the tallest trees; flowers from February to May, fruit in August and September. DISTRIB.: Throughout the greater part of India, extending to Java and the Philippines. The twigs and leaves are much liked by elephants. The fruit is made into a pickle.

X.—RESEDACEÆ.

HERBS, rarely shrubs. *Leaves* alternate, entire or pinnatisect. *Stipules* 0, or minute and glandular. *Flowers* small, in spikes or racemes, bracteate. *Calyx* persistent, 4-7-partite, often irregular. *Sepals* imbricate in bud. *Petals* 2-7, hypogynous, entire or lobed, equal or the posticous larger, open in bud. *Disk* conspicuous (0 in *Oligomeris*). *Stamens* usually many (3-8 in *Oligomeris*), free or connate, equal or unequal. *Ovary* 1-celled, of 2-6 connate carpels, often lobed at the top and open between the lobes which bear the sessile stigmas; *ovules* on 2-6 parietal placentas. *Fruit* capsular, open at the top, rarely indehiscent. *Seeds* many, reniform, without albumen.

To this family belongs the garden *Mignonette* (Reseda odorata L.), the native country of which is not exactly known. *R. luteola*, *L.* (Dyer's weed, or Weld) is found wild in Afghanistan.

OLIGOMERIS, Camb.; Fl. Brit. Ind. i. 181.

Herbs. *Leaves* linear, fascicled. *Flowers* small, in spikes. *Calyx* 4-partite. *Petals* 2, free or connate. *Disk* 0. *Stamens* 3-8, free or 1-adelphous. *Ovary* 4-lobed, open at the apex; placentas 4; *ovules* many. *Capsule* subglobose, angled, 4-pointed.

O. glaucescens, *Camb. in Jacquem. Voy. Bot. 24, t. 25; F. B. I. i. 181.*

An erect glaucous much-branched annual, 6-12 in. high. *Leaves* narrowly linear, 1-2 in. long; *stipules* minute, subulate. *Spikes* terminal dense-flowered. *Flowers* minute, greenish-white. *Petals* 2, connate alternate with the posterior sepal. *Capsule* small, deeply 4-lobed, membranous. *Seeds* minute, shining.

Near Delhi. DISTRIB.: Punjab, Sindh, and Konkan Hills; westward to Spain and the Canary Islands.

XI.—VIOLACEÆ.

HERBS or shrubs. *Leaves* alternate, entire or pinnatisect, stipulate. *Flowers* regular or irregular, 2-sexual, 2-bracteolate. *Sepals* 5, distinct, equal or unequal, imbricate, persistent. *Petals* 5, distinct, equal or unequal, imbricate or contorted in bud. *Stamens* 5; *filaments* short, broad; *anthers* distinct or connate; connective broad, produced beyond the cells. *Ovary* sessile, 1-celled; *ovules* numerous, inserted on 3 parietal placentas. *Fruit* a 3-valved capsule, rarely a berry. *Seeds* small, with fleshy albumen.

Corolla irregular.	
Sepals produced at the base, anthers connate .	1. VIOLA.
Sepals not produced at the base, anthers distinct	2. IONIDIUM.
Corolla regular	3. ALSODEIA.

1. VIOLA, Linn.; Fl. Brit. Ind. i, 182.

Herbs, rarely shrubby below. *Flowers* often dimorphic. *Sepals* produced at the base. *Petals* erect or spreading, the largest spurred or saccate at the base. *Anthers* connate, connectives of the 2 lower often spurred at the base. *Style* clavate or truncate, tip straight or oblique; *stigma* obtuse, lobed or cupular. *Capsule* 3-valved. *Seeds* many, ovoid or globose.

The common sweet-scented *Violet* (V. odorata, L.) is found wild in Kashmir. *V. tricolor L.* is the 'Pansy' or 'Heartsease.'

Stigma terminal, 3-lobed	1. *V. Patrinii.*
Stigma lateral, 2-lobed	2. *V. cinerea.*

1. V. Patrinii, *Ging. in DC. Prod. i, 293; W. & A. Prod. 32; F. B. I. i, 183.* V. primulæfolia, *Linn. (in part); Roxb. Fl. Ina. i, 650.* V. prionantha, *Bunge; Royle Ill. 121.*

A glabrous or pubescent perennial herb with a very short tufted root-stock. *Leaves* very variable, 3-4 in. long, all radical, triangular-ovate oblong or linear, coarsely crenate or serrate; base hastate cordate or cuneate: petiole 2-4 in., often winged; *stipules* linear, adnate, entire. *Flowers* ½-¾ in. in diam., exceeding the leaves, lilac. *Bracts* linear. *Sepals* lanceolate, acute, glabrous. *Petals* oval, obtuse, with short claws; *spur* saccate. *Style* nearly straight, slender; *stigma* 3-lobed, dilated. *Capsule* ¼-½ in. long; valves narrow, acute.

Dehra Dun and Saharanpur Districts, in grassy places. DISTRIB.: Punjab plain; Himalaya, from Kashmir to Bhutan up to 8,000 ft., Afghanistan, North Asia, Japan. On the Himalaya the flowers are usually sweet-scented.

2. V. cinerea, *Boiss. Diagn. Ser. I, i. 7; Fl. Or. i. 454; F. B. I. i. 185; Watt E. D.*

A small perennial herb, grey with minute papilli. *Stem* 1-6 in., diffuse branched. *Leaves* ¼-½ in. long, narrowly ovate or lanceolate, acute or apiculate, obscurely crenate; *stipules* leafy, fimbriate. *Flowers* ⅓in. in diam., on slender axillary peduncles; *bracts* setaceous. *Sepals* aristate. *Petals* not bearded; *spur* very short. *Style* clavate, compressed; *stigma* lateral, of 2 oblong parallel disks. *Capsule* elliptic, acute.

Jumna and Chambal ravines. DISTRIB.: Punjab, Sindh, extending to Afghanistan, Persia and Arabia. The roots of this plant are said to be used medicinally like those of *V. odorata* and *V. serpens*, the latter being abundant on the W. Himalaya. They are sold in the bazars under the name of "*banafsha.*"

2. IONIDIUM, Vent.; Fl. Brit. Ind. i. 185.

Herbs or undershrubs. *Leaves* alternate, rarely opposite. *Flowers* axillary, orange or purple. *Sepals* 5, subequal, not produced at the base. *Petals* 5, lower larger, clawed saccate or spurred at the base. *Anthers* connate or free, 2 or 4 of them gibbous or spurred at the back. *Ovary* ovoid; *style* clavate, incurved; *stigma* oblique. *Capsule* 3-valved, subglobose, few-seeded. *Seeds* globose; testa crustaceous.

1. heterophyllum, *Vent. Jard. Malm. 27.* I. suffruticosum, *Ging.; W. & A. Prod. 32; F. B. I. i, 185; Watt E. D.* I. enneaspermum, *DC.; W. & A. Prod. 33; Royle Ill. 74; D. & G. Bomb. Fl. 12.* I. hexaspermum. *Dalz.; D. & G. l.c.* Viola suffruticosa & enneasperma, *Roxb. Fl. Ind. i, 649.* Vern. *Ratan-purus.*

Glabrous or pubescent. *Branches* diffuse, woody. *Leaves* 1½-2 in., subsessile, linear or lanceolate, serrate; *stipules* subulate, gland-tipped. *Flowers* solitary, red; pedicels shorter than the leaves. *Petals* variable; four of them oblong, acute or mucronate, the fifth with a long claw and a large oval or orbicular limb. *Seeds* striate.

Not uncomnon in the districts of Agra and Delhi, and in Bundelkhand. DISTRIB.: Bengal and southward to Ceylon; Trop. Asia, Africa and Australia. The roots and leaves are used medicinally.

3. ALSODEIA, Thouars; Fl. Brit. Ind. i. 186.

Trees or shrubs. *Leaves* usually alternate, distichous; *stipules* rigid. *Flowers* small, axillary or terminal; peduncles with many bracts. *Sepals* 5, subequal, rigid. *Petals* 5, subequal, sessile. *Stamens* 5, inserted inside or on an annular disk; connective produced into an appendage. *Ovary* ovoid; *style* straight; *stigma* terminal. *Capsule* 3-valved, few-seeded.

A. Roxburghii, *Hk. f. & T. in F. B. I. i. 186.* Vareca heteroclita, *Roxb. Fl. Ind. i, 643.*

A small shrub. *Branchlets* compressed, pubescent on one side. *Leaves* 1-1½ in. long, sessile, alternate, cuneate-lanceolate, obtuse, crenate, glabrous, pale beneath, perforate at the nerve-axils beneath; *stipules* subulate from a broad base. *Flowers* fascicled, glabrous, $\frac{1}{10}$ in. in diam., white. *Sepals* unequal, obtuse. *Petals* linear, tips revolute. *Disk* 10-toothed. *Stamens* exserted; *anthers* white, cohering in a cone, base of cells tomentose; appendage oblong, obtuse. *Ovary* glabrous; *style* fili-form, pubescent. *Capsule* 1-few-seeded.

Oudh (Genl. Martin). DISTRIB.: Sylhet, Andamans.

XII.—BIXINE.

TREES or shrubs. *Leaves* alternate; *stipules* minute or 0. *Flowers* regular, 2-sexual or dicœcious. *Sepals* usually 4-5, imbricate, deciduous. *Petals* 4-5, or 0, imbricate and contorted in bud, deciduous. *Stamens* many. *Disk* thickened, often glandular. *Ovary* 1-celled or apparently 2-8-celled; *style* and *stigmas* free or united; *ovules* parietal. *Fruit* dry or fleshy, indehiscent or valvular; valves bearing the seeds in the middle. *Seeds* arillate, or with pulpy testa; albumen fleshy.—Species chiefly tropical.

To this family belongs the Chaulmugra tree (*Taraktogenos Kurzii King*), the seeds of which yield a valuable medicinal oil. It is found in Chittagong, Sylhet, and in Lower Burma.

Flowers 2-sexual, petals large.
- Leaves palmate, seeds covered with cotton . . . 1. COCHLOSPERMUM.
- Leaves entire, seeds naked . . . . 2. BIXA.

Flowers dicœcious, petals 0.
- Ovary apparently 2-8 celled, styles 2 or more . . . . . 3. FLACOURTIA.
- Ovary 1-celled, style 1. . . . . 4. XYLOSMA.

1. COCHLOSPERMUM, Kunth.; Fl. Brit. Ind. i. 189.

Trees or shrubs with yellow or red juice. *Leaves* digitately lobed or divided, *Flowers* large, yellow, 2-sexual. *Sepals* 5. *Petals* 5, large. *Stamens* many, on an eglandular disk; *anther*-cells opening by pores or short slits at the top. *Ovary* globose, almost 3-5-celled, *style* simple; *stigma* toothed; *ovules* many, on 3-5 parietal placentas. *Capsule* 3-5-valved, endocarp membranous. *Seeds* cochleate, woolly; testa hard.

C. Gossypium, *DC. Prod. i, 527; W. & A. Prod. 87; Brand. For. Fl. 17; F. B. I. i. 190; Watt E. D.* Bombax Gossypium, *Linn.; Roxb. Fl. Ind. iii, 169.* Vern. *Kumbi, gabdi.*

A 'small' soft-wooded tree with short thick spreading branches, the younger ones tomentose and bearing the scars of the fallen leaves and fruit-stalks. *Leaves* on long slender petioles, 3-8 in. in diam., 3-5-palmately lobed, tomentose beneath; lobes acute or acuminate, entire. *Flowers* 4-5 in. across, in few-flowered terminal panicles, golden yellow. *Sepals* unequal, broadly oval, silky. *Petals* obovate, notched. *Capsule* 2-3 in., oval, 5-lobed.

Siwalik range, N. Oudh, and on dry hills in Bundelkhand. DISTRIB.: Bengal, C. India and the Dekkan. Flowers Feb—April, before the leaves appear; the fruit ripens in June and July. A clear white gum (*katira*) exudes from the bark.

2. BIXA, Linn.; Fl. Brit. Ind. i. 190.

A tree. *Leaves* simple; *stipules* minute. *Flowers* in terminal panicles, 2-sexual. *Sepals* and petals 5. *Anthers* opening by 2 terminal pores. *Ovary* 1-celled; style slender, curved, stigma notched; *ovules* many, on 2 parietal placentas. *Capsule* loculicidally 2-valved. *Seeds* many, testa pulpy; albumen fleshy.

B. Orellana, *Linn. Sp. Pl. 512; Roxb. Fl. Ind. ii, 581; W. & A. Prod. 31; F. B. I. i. 190; Brand. For. Fl. 17; Watt E. D.* Vern. *Latkan.* (Arnotto.)

A small evergreen tree. Young shoots and inflorescence rusty-puberulous. *Leaves* 4-8 in. long, cordate, acuminate, glabrous. *Flowers* 2-3 in. across, in terminal panicles, white or pink. *Capsule* ovoid, covered with long weak bristles.

Introduced from tropical America, and now cultivated throughout India for the dye prepared from the pulp surrounding the seeds.

3. FLACOURTIA, Commers.; Fl. Brit. Ind. i. 191.

Trees or shrubs, often thorny. *Leaves* toothed or crenate. *Flowers* small, usually dicœcious. *Sepals* 4-5, small, imbricate. *Petals* 0. *Stamens* many; *anthers* versatile. *Ovary* on a glandular disk; *styles* 2 or more; *stigmas* notched or 2-lobed; *ovules* usually in pairs on each placenta. *Fruit* indehiscent; endocarp hard, with as many cells as seeds. *Seeds* obovoid, testa coriaceous.

Leaves ovate or lanceolate, acuminate . .	1. *F. Cataphracta.*
Leaves ovate or orbicular, obtuse.	
A small tree, stigmas 5-11	2. *F. Ramontchi.*
A thorny shrub, stigmas 3-4	3. *F. sepiaria.*

1. F. Cataphracta, *Roxb. ex Willd. Sp. Pl. iv, 830; Fl. Ind. iii. 834; F. B. I. i. 193; Watt E. D.*

A small tree armed with compound spines. *Branches* white-dotted, glabrous. *Leaves* petioled, 2-4 in. long, oblong or oblong-lanceolate, acuminate, crenate-serrate, membranous and shining on both surfaces. *Flowers* very small, dicœcious, in irregular glabrous racemes. *Ovary* flask-shaped; *stigmas* 4-6, capitate. *Fruit* the size of a small plum, purple. *Seeds* 8-12.

Dehra Dun, Moradabad. DISTRIB.: Bengal, Assam, Malay Pen., extending to China. Often cultivated. Various parts of the plant are used medicinally; the seeds yield an oil, and the acid fruit is eaten.

2. F. Ramontchi, *L'Herit. Stirp. Nov. 59, t. 30; W. & A. Prod. 29; D. & G. Bomb. Fl. 10; F. B. I. i. 193; Brand. For. Fl. 18; Watt E. D.*

A small spinous tree or shrub. Branchlets glabrous or pubescent. Leaves very variable, elliptic-oblong, obovate or suborbicular, crenate, glabrous or more or less pubescent or tomentose beneath. Flowers dicœcious, in short branched glabrous or hairy racemes. *Stigmas* 5-11, free or connate. The typical form is found in South India and Ceylon, wild or cultivated; it also occurs in Madagascar where "*Ramontchi*" is its native name. The following varieties are found within the area of this flora:—

VAR. 1. sapida, *F. B. I. l.c.* F. sapida, *Roxb.; Fl. Ind. iii, 835; W. & A. Prod. 29.* Vern. *Bilangra, kandai, kango* (Dehra Dun). Shrubby, branchlets pubescent. Leaves elliptic to suborbicular, glabrous, or puberulous on the veins beneath—Gangetic Plain (Royle). DISTRIB.: C and S. India. The fruit is eaten raw or cooked, and the twigs and leaves are used as fodder.

VAR. 2. occidentalis, *F. B. I. l.c.* Whole plant more or less softly tomentose. Leaves 1-2 in., broadly oblong, orbicular or obovate.—Dehra Dun and Saharanpur forests, Rohilkhand, Oudh. DISTRIB.: Chota Nagpur and Behar westward to Central India and the Punjab; outer Himalaya up to 4,000 ft.; also in Baluchistan.

3. F. sepiaria, *Roxb. Cor. Pl. i. 48, t. 68; Fl. Ind. iii. 835; W. & A. Prod. 29; Royle Ill. 73; D. & G. Bomb. Fl. 11; Brand. For. Fl. 18; F. B. I. i. 194; Watt E. D.* Vern. *Kondai.*

A stiff thorny bush or small tree, the spines usually bearing flowers and fruit. *Leaves* 1-2 in. long, in fascicles, obcordate obovate oblong or orbicular, often cuneate at the base, crenate-serrate, rigid, coriaceous and shining when old. *Flowers* very small, dicœcious, solitary or few, in axillary nearly glabrous racemose clusters shorter than the leaves *Stigmas* 3-4, on short styles. *Drupe* the size of a large pea, purple.

Dehra Dun. DISTRIB.: Kumaon, Bengal, southward to Ceylon, extending to Java. The leaves, root and bark are used medicinally, the fruit is eaten, and the leaves are collected for fodder.

4. XYLOSMA, Forst.; Fl. Brit. Ind. i. 194.

Characters of *Flacourtia*, but *ovary* 1-celled, with 2 rarely 3-6 few-ovuled parietal placentas. *Style* 1, very short; *stigma* capitate. *Berry* globose, 2-8-seeded.

X. longifolium, *Clos. in Ann. Sc. Nat. Ser. IV, viii. 230; Brand. For. Fl. 19, t. iv; F. B. I. i. 194; Watt E. D.* Vern. *Kattári* (Dehra Dun), *kattáwa* (Oudh).

A moderate-sized evergreen tree, with rather long and slender branches *Leaves* 4-9 in. long, alternate, short-petioled, oblong-lanceolate, obtusely serrate, coriaceous, shining; nerves 8-12 pairs. *Flowers* dioecious, small, yellow, in short axillary compact panicles. *Bracts* ovate, acuminate. *Stamens* many, exserted, twice the length of the sepals, inserted inside the red annular disk.

Dehra Dun and Siwalik range. DISTRIB.: Himalaya, from Hazara to Kumaon, up to 5,000 ft.; also in Chota Nagpur and Assam. The flowers, which appear in the cold season, are very attractive to bees.

XIII.—PITTOSPOREÆ.

TREES, or erect rarely climbing shrubs. *Leaves* alternate or subverticillate, exstipulate, entire. *Flowers* usually hermaphrodite, terminal or axillary. *Sepals* 5, imbricate. *Petals* 5, hypogynous, imbricate. *Stamens* 5, opposite the sepals; *anthers* versatile. *Ovary* 1-celled, with 2-5 parietal placentas or 2-5-celled by the projection of the placentas; *style* simple; *stigma* terminal, 2-5-lobed; *ovules* many, parietal or axile. *Fruit* capsular or indehiscent. *Seeds* usually many; albumen copious.

PITTOSPORUM, Banks; Fl. Brit. Ind. i. 198.

Erect trees or shrubs. *Sepals* free or connate below. *Petals* erect, connivent or connate at the base. *Stamens* erect; *anthers* 2-celled, introrse, bursting by slits. *Ovary* incompletely 2-3-celled. *Fruit* a 1-celled woody usually 2-valved capsule; valves placentiferous in the middle. *Seeds* smooth, imbedded in pulp.

Young branches, leaves and capsule glabrous . 1. *P. floribundum.*

Young branches, leaves and capsule tomentose . 2. *P. eriocarpum.*

1. P. floribundum. *W. & A. Prod. 154; Royle Ill. 77; D. & G. Bomb. Fl. 44; F. B. I. i. 199; Brand. For. Fl. 19; Watt E. D.* Celastrus verticillata, *Roxb. Fl. Ind. i. 624.*

A small handsome tree. *Branches* often in verticils. *Leaves* crowded towards the ends of the branchlets, 2-8 in. long, lanceolate or oblong-lanceolate, acute or acuminate, glabrous, shining, pale below, thinly coriaceous, margins waved. *Flowers* many, small, pubescent, in terminal compound corymbs, yellowish. *Sepals* ovate, obtuse or acute, concave, ciliate at the apex. *Petals* free, linear-oblong, obtuse. *Ovary* pubescent. *Capsule* ¼ in. in diam., glabrous, rugose; valves hard, broadly ovate. *Seeds* about 6, with a soft scarlet aril-like integument.

Dehra Dun and Siwalik range. DISTRIB.: Subtrop. Himalaya from the Jumna to Sikkim, ascending to 5,000 ft.; Khasia Hills and Mishmi; also in W. & S. India. Flowers from January to June.

2. **P. eriocarpum**, *Royle Ill. Bot. Him. 77; F. B. I. i. 199; Brand. For. Fl. 20.*

A small tree with spreading subverticillate branches. Leaves, young branches and inflorescence yellow-tomentose. *Leaves* 3-8 in. long, ovate obovate or broadly lanceolate, obtuse or acute. *Flowers* ½ in. long, in short dense terminal corymbose panicles, pale yellow. *Sepals* lanceolate, densely tomentose. *Petals* free, linear, erect. *Ovary* tomentose; *Style* short, glabrous. *Capsule* ¼ in. in diam., tomentose; valves broadly ovate, woody, many-seeded.

Dehra Dun. DISTRIB.: Outer Himalaya from the Jumna to the Sarda, up to 6,500 ft. Flowers March and April.

XIV.—POLYGALEÆ.

ANNUAL or perennial herbs, erect or scandent shrubs, or timber trees. *Leaves* alternate, rarely whorled, simple, entire, occasionally reduced to scales, or 0; *stipules* 0. *Flowers* irregular, 2-sexual, 3-bracteate. *Sepals* 5, unequal, 2 inner often petaloid, imbricate in bud. *Petals* 5 or 3, distinct, unequal, the inferior usually keel-shaped. *Stamens* usually 8, hypogynous; *filaments* united into a sheath, rarely distinct; *anthers* usually opening by terminal pores. *Ovary* free, 1-3-celled; *style* generally curved; *stigma* capitate; *ovules* 1 or more in each cell. *Fruit* generally a 2-celled 2-seeded loculicidal capsule. *Seeds* usually strophiolate, albuminous.

POLYGALA, Linn.; Fl. Brit. Ind. i. 200.

Herbs, rarely shrubs. *Leaves* alternate. *Sepals* usually persistent; the 2 inner larger and usually petaloid. *Petals* 3, united at the base into the staminal sheath; inferior keel-shaped, usually crested. *Stamens* 8; *filaments* united ½ way up into a split sheath; *anthers* opening by pores. *Ovary* 2-celled; *ovules* 1 in each cell, pendulous. *Capsule* 2-celled and 2-seeded, opening loculicidally. *Seeds* strophiolate and albuminous.

There are about 250 species, widely distributed over the greater part of the world. In England they are known under the name of "Milkwort."

Wings petaloid.

Perennial, racemes dense-flowered, strophiole 2-lobed	1. *P. crotalarioides.*
Annual, racemes few-flowered, strophiole without appendages	2. *P. erioptera.*

Wings herbaceous, strophiole 3-lobed.

Annual; bracts persistent, capsule ciliate	3. *P. chinensis.*
Perennial; bracts caducous.	
Stems prostrate, capsule glabrous	4. *P. telephioides.*
Stems erect, capsule strongly ciliate	5. *P. glomerata.*

1. P. crotalarioides, *Buch.-Ham. ex. DC. Prod. i. 327; Royle Ill. 76, t. 19 C.; F. B. I. i, 202; Watt E. D.*

A small erect perennial herb. *Stems* 4-8 in., villous with spreading hairs. *Leaves* 1-2 in. long, shortly stalked, elliptic or oblong-obovate, apex rounded or mucronate, ciliate. *Racemes* short, dense-flowered, rarely terminal. *Flowers* ¼-½ in. long, very shortly pedicelled, reddish-purple. *Bracts* minute, subulate, persistent. *Wings* petaloid, obovate, twice as long as the capsule. *Capsule* broader than long, notched, strongly ciliate. *Seeds* hairy. *Strophiole* with 2 small ovate appendages.

Dehra Dun, Rohilkhand, N. Oudh, Gorakhpur. DISTRIB.: Himalaya from Chamba to Sikkim, up to 7,000 ft.; also on the Khasia Hills. Royle states that this plant is employed on the Himalaya as a cure for snake-bite in the same manner as *P. Senega* is in America.

2. P. erioptera, *DC. Prod. i. 326; F. B. I. i, 203.* P. Vahliana, *DC.; W. & A. Prod. 36; D. & G. Bomb. Fl. 13.* P. noucherensis, *Camb. in Jacquem. Voy. Bot. 24, t. 26.*

An erect or decumbent annual, very variable in habit. *Leaves* ½-1 in. long, from obovate or almost obcordate to narrow-linear. *Racemes* few-flowered, axillary or extra-axillary. *Flowers* ⅛-¼ in., on slender pedicels, yellow. *Bracts* minute, persistent. *Wings* petaloid, obliquely oblong, with a strong green midrib, membranous in fruit, longer than the ovate notched pubescent capsule. *Seeds* densely hairy. *Strophiole* without appendages.

Rocky and waste ground in Merwara, Bundelkhand and Gwalior; also in the Jumna and Chambal ravines in the Etawah, Agra and Delhi districts. DISTRIB.: Plains of Punjab and Sindh, Chota Nagpur, C. and S. India, and Burma; extending to Arabia and Africa.

3. P. chinensis, *Linn. Sp. Pl. 704; F. B. I. i, 204; Watt E. D.* P. arvensis, *Willd.; Roxb. Fl. Ind. iii. 218; W. & A. Prod. 36; D. & G. Bomb. Fl. 12.* P. Rothiana, *W. & A. Prod. 37; D. & G. l c. 13.*

A leafy rather stout annual, erect or diffuse, but very variable. *Stems* usually procumbent, 3-10 in. long, glabrous or pubescent. *Leaves*

¼-2 in. long, from orbicular-oblong or obcordate to narrow-linear, rather thick and coriaceous, glabrous ciliate hoary or pubescent; petioles very short. *Racemes* short, dense-flowered, truncate, axillary or extra-axillary. *Flowers* ⅛-¼ in. long, horizontal or pendulous. Outer *sepals* small, ovate. *Wings* very oblique, acute. Crest of *corolla* often small. *Capsule* suborbicular, shorter than the wings, notched, narrowly winged, ciliate. *Seeds* silky. *Strophiole* with 3 very short appendages.

Dehra Dun, Moradabad, Agra, Bundelkhand. DISTRIB.: Plains of India from the Punjab to Burma, and through C. and S. India to Ceylon; also in Australia. The plant is eaten during famine times in Western India.

4. P. telephioides, *Willd. Sp. Pl. iii, 876; W. & A. Prod. 36; F. B. I. i, 205; Watt E. D.*

A dwarf prostrate perennial herb, 2-4 in. high, with many short thick prostrate or ascending pilose branches from a woody rootstock. *Leaves* small, sessile, crowded, about ⅛ in. long, obovate or oblong, obtuse or acute, very thick, margins usually recurved. *Flowers* very small, fascicled on short extra-axillary peduncles. Outer *sepals* acute. *Wings* herbaceous, oblique, acuminate. *Capsule* ⅛ in., broadly ovoid, deeply notched, glabrous, not winged. *Seeds* very small, silky. *Strophiole* minutely appendaged.

Delhi (Royle), Bundelkhand (Edgeworth). DISTRIB.: S. India and Ceylon to Malay Archipel., China and the Philippines.

5. P. glomerata, *Lour. Fl. Cochinch. 426; F. B. I. i, 206.*

Stems many, 1-2ft. high, densely pubescent, erect or ascending from a woody stock. *Leaves* 1½-2½ in. long, broadly ovate or oblong to elliptic-lanceolate and linear. *Racemes* scattered, extra-axillary, very short, 2-3 fld. *Flowers* drooping, ¼-½ in. long, green. Outer *sepals* acuminate, ciliate. *Wings* herbaceous, hatchet-shaped, accuminate and awned. *Crest* very small. *Capsule* narrowly winged, strongly ciliate. *Seeds* large, obovoid, silky. *Strophiole* with 3 short appendages.

Oudh (F. B. I.). DISTRIB.: Sikkim, Assam, Khasia Hills, Burma, Malay Archipel., and China.

XV.—CARYOPHYLLEÆ.

HERBS, rarely undershrubs. *Branches* opposite, usually thickened at the joints. *Leaves* opposite, entire or serrulate, often connate. *Stipules* scarious or 0. *Flowers* rarely 1-sexual. *Sepals* 4-5, free or connate, imbricate in bud. *Petals* 4-5, rarely 0, usually inserted on a hypogynous ring. *Stamens* 8 or 10, rarely fewer, inserted with the petals; *anthers* 2-celled. *Disk* small and annular, or elongated into a gynophore, or broken up into glands. *Ovary* free, 1-celled, or imperfectly 3-5-celled; *styles* 2-5, free or connate; *ovules* 2 or

many, on slender basal funicles, or with the funicles united into a column. *Capsule* membranous or crustaceous, rarely fleshy, opening by valves equal in number or double that of the styles, rarely indehiscent. *Seeds* few or many; embryo more or less curved and surrounding the mealy albumen.

A large family containing over 800 species, inhabiting chiefly arctic and temperate regions. The Indian species are mostly Himalayan. The few kinds met with in the plains are usually in flower during the cold season, and a certain number of these are evidently introduced weeds of cultivation. Of ornamental plants belonging to this family, the following are commonly grown in the gardens of N. India :—*China pink* (Dianthus chinensis), *Carnation* (D. Caryophyllus), *Sweet William* (D. barbatus).

Calyx gamosepalous, 5-toothed, petals clawed, stamens inserted on a gynophore, styles free, stipules 0.

- Styles 2 . . . . . 1. SAPONARIA.
- Styles 3 . . . . . 2. SILENE.

Sepals free, petals subsessile; stamens inserted on an annular disk, rarely perigynous.

- Styles free.
  - Stipules 0, styles 3-4.
    - Petals 2-fid . . . . . 3. STELLARIA.
    - Petals entire or lacerate . . . 4. ARENARIA.
  - Stipules scarious, styles 3 or 5 . . . 5. SPERGULA.
- Styles connate, 3-fid or -toothed; stipules scarious.
  - Petals bifid . . . . . 6. DRYMARIA.
  - Petals entire or nearly so.
    - Sepals keeled on the back . . . 7. POLYCARPON.
    - Sepals scarious, not keeled . . . 8. POLYCARPÆA.

1. SAPONARIA, Linn.; Fl. Br. Ind. i. 217.

Annual or perennial herbs. *Flowers* in dichotomous cymes. *Calyx* cylindric in flower, 5-toothed. *Petals* 5, clawed; limb entire or notched, with or without a basal scale. *Stamens* 10. *Gynophore* short. *Styles* usually 2. *Ovules* many. *Capsule* ovoid or oblong, 4-toothed. *Seeds* reniform or subglobose.

S. Vaccaria, *Linn. Sp. Pl. 409; Royle Ill. 79; F. B. I. i, 217; Watt E. D.* S perfoliata, *Roxb. Fl. Ind. ii, 445.* Gypsophila Vaccaria, *Sibth. & Sm.; W. & A. Prod. 42.*

A glabrous annual, 12-14 in. high. *Leaves* 1-3 in. long, connate at the base, 3-nerved, acute; radical oblong; cauline linear-oblong, sessile. *Pedicels* slender. *Calyx* ¼ in. long, tubular, with 5 broad green nerves, ventricose in fruit. *Petals* obovate, without a basal scale, erose at the apex, pink. *Capsule* included, broadly ovoid. *Seeds* large, globose, black, granulate.

A common weed in fields of *wheat* and *barley*, flowering towards the end of the cold season. DISTRIB.: Throughout India, and in Tibet; also in Europe, Asia Minor, and Siberia; and in America and in other countries as a weed of cultivation. This plant possesses medicinal properties similar to those of the European *Soapwort* (S. officinalis), and the juice of it is used by the natives of India as a substitute for soap.

2. SILENE, Linn.; Fl. Br. Ind. i. 217.

Annual or perennial herbs, *Flowers* solitary or cymose, often secund on the branches of the cyme. *Calyx* more or less inflated, ovoid or tubular, 5-cleft, usually 10-nerved. *Petals* 5, claw narrow; limb entire, bifid or laciniate, usually with 2 basal scales. *Stamens* 10, of which 5 are usually adnate to the petals. *Disk* more or less prolonged into a gynophore. *Ovary* incompletely 3-celled, rarely 1-celled; *styles* 3, rarely 5; *ovules* numerous. *Capsule* 3-6-toothed or-valved. *Seeds* reniform, usually tubercled.—Species chiefly of temperate Europe and Asia.

S. conoidea, *Linn. Sp. Pl. 418; Royle Ill. 79; F. B. I. i, 218.*

An erect dichotomously branched gland-pubescent annual, 6-18 in. high. *Leaves* 2-4 in. long; radical spathulate; cauline sessile, oblong or lanceolate, acute. *Flowers* panicled. *Calyx* 1 in, inflated in fruit, base intruded; teeth ⅓ the length of the tube. *Petals* small, claw auricled; limb obovate, entire or erose, pink, with 2 scales at the base. *Capsule* sessile, ovoid, contracted above, crustaceous, shining. *Seeds* cochleate with 5 dorsal and as many lateral rows of tubercles.

Common as a weed in cornfields. DISTRIB.: Punjab Plain; W. Himalaya up to 8,000 ft.; westward to the Atlantic Ocean.

3. STELLARIA, Linn.; Fl. Br. Ind. i. 229.

Usually slender herbs. *Leaves* various. *Flowers* in dichotomous cymes, rarely solitary and terminal, white. *Petals* 5, rarely 4 or 0. *Stamens* usually 10, hypogynous or perigynous. *Disk* annular or divided into glands. *Ovary* 1-rarely 3-celled; *styles* usually 3; *ovules* many. *Capsule* short, splitting into as many entire or 2-fid valves as there are styles. *Seeds* compressed.—Species of cold and temperate regions.

S. media. *Cyrill. Char. Comm. 36. F. B. I. i. 230; Watt E. D.* (Com m Chickweed.)

Annual. *Stems* 6 in. to 2 ft. long, decumbent, much-branched, glabrous except for a line of hairs, flaccid, green. *Leaves* ½-1 in. long; lower petioled, ovate or cordate, acuminate; upper sessile, lanceolate. *Flowers* ¼-½ in. in diam., axillary and in terminal cymes, pedicels slender, glabrous or gland-pubescent. *Sepals* free to the base, obtuse or subacute, hairy glandular or covered with raised points. *Petals* shorter than the sepals or 0. *Stamens* 3-10. *Styles* 3. *Capsule* ovoid, longer than the sepals. *Seeds* brown, acutely tubercled.

A common weed. DISTRIB.: Punjab, Rajputana, Bengal; Himalaya up to 12,000 ft.; Arctic and N. Temperate regions.

4. ARENARIA, Linn.; Fl. Brit. Ind. i. 235.

Annual or perennial often tufted herbs. *Flowers* solitary or in dichotomous cymes. *Sepals* 5. *Petals* 5, rarely 0, never 2-fid. or 2-partite *Stamens* usually 10, hypogynous or inserted on the perigynous disk. *Ovary* 1-celled; *styles* usually 3-4; *ovules* many. *Capsule* short, rarely exceeding the sepals, 2-6 valved. *Seeds* smooth or tubercled. —Natives of cold and temperate regions.

A. serpyllifolia, *Linn. Sp. Pl. 423; F. B. I. 239.*

Annual. *Branches* many from the root, 2-10 in., decumbent or suberect, pubescent all round. *Leaves* ¼-⅜ in., subsessile, ovate, acuminate, 1-3-nerved, rigid, ciliate. *Cymes* many-flowered. *Bracts* leaf-like. *Flowers* ⅛-¼ in. across: pedicels slender, erect or spreading in fruit. *Sepals* ovate lanceolate, much exceeding the petals, 3-5-ribbed, pubescent. *Capsule* 6-valved, ovoid, about as long as the sepals. *Seeds* tubercled.

Dehra Dun, Saharanpur, Rohilkhand. DISTRIB.: Punjab Plain, Himalaya from Nepal to Kashmir, up to 11,000 feet, extending through Afghanistan to Europe.

5. SPERGULA, Linn.; Fl. Brit. Ind. i. 243.

Annual or perennial herbs with forked or fascicled branches. *Leaves* opposite, often with leafy buds in their axils, hence apparently whorled. *Stipules* small, scarious. *Flowers* in peduncled panicled cymes. *Sepals* 5. *Petals* 5, entire. *Stamens* 5 or 10, inserted on a perigynous disk. *Ovary* 1-celled; *styles* 3 or 5; *ovules* many. *Capsule* with 3 or 5 entire valves. *Seeds* compressed, margined or winged.

Leaves in false whorls, seeds winged.

Green, seeds granulate or papillose . .	1. *S. arvensis.*
Glaucous, seeds smooth	2. *S. pentandra.*
Leaves opposite, flat, seeds not winged . .	3. *S. rubra.*

1. S. arvensis, *Linn. Sp. Pl. 440; F. B. I. i. 243; Watt E. D.* (Corn Spurrey).

A green sparingly pubescent annual. *Stems* 6-18 in. long, branched from the root, geniculate *Leaves* ½-2 in., in false whorls, linear-subulate, spreading, ¼-terete, grooved beneath, rather fleshy. *Flowers* ¼-¼ in. in diam., subumbellate; pedicels spreading or deflexed. *Sepals* ovate, obtuse; *Petals* obtuse, white. *Styles* 5 or 3. *Capsule* ovoid, longer than the calyx. *Seeds* keeled or narrowly winged, granulate or papillose, black.

Plentiful in cultivated ground, flowering during the cold season. DISTRIB.: Punjab, and throughout the N. Hemisphere. Grown in Europe as a fodder plant.

2. S. pentandra, *Linn. Sp. Pl. 440; F. B. I. i. 243.* Arenaria flaccida, *Roxb. Fl. Ind. ii. 447.*

A glaucous annual. *Leaves* in false whorls, linear-subulate, terete, not grooved beneath. *Petals* lanceolate, acute, white. *Seeds* plano-compressed, smooth, wing often as broad as the striated nucleus.

Common in cultivated fields. DISTRIB.: Punjab, Bengal, and throughout the N. Hemisphere. Very similar to the preceding and difficult to distinguish when dried.

3. S. rubra, *D. Distr. Syn. Pl. ii, 1598; F. B. I. i, 244.* Arenaria rubra *L.* (Sand Spurrey).

A suberect or prostrate glahd-pubescent annual. *Stems* 4-8 in. long. *Leaves* ¼-1 in. long, simply opposite, linear, flat, fleshy; *stipules* cleft, broad, silvery. *Flowers* ¼-⅓ in. across. *Sepals* lanceolate, obtuse, margins scarious. *Petals* obovate, shorter than the sepals, pink or white. *Stamens* 5 or 10. *Styles* 3. *Capsule* ovoid, longer than the calyx. *Seeds* not winged, pale brown, scabrid.

Meerut District (Edgeworth). DISTRIB.: Punjab Plain, extending to N.-W. Asia and Europe.

6. DRYMARIA, Willd.; Fl. Brit. Ind. i. 244.

Diffuse or suberect dichotomously branching herbs. *Leaves* opposite, flat; *stipules* small, often fugacious. *Flowers* axillary or terminal, solitary or in cymes. *Sepals* 5, herbaceous. *Petals* 5, deeply bifid. *Stamens* 5, or fewer, slightly perigynous. *Ovary* 1-celled; *style* 3-fid. *Capsule* 3-valved.—Species about 30, nearly all Tropical American.

D. cordata, *Willd. ex Rœm. & Schult. Syst. V, 406; W. & A. Prod. 359 F. B. I. i, 244.* Cerastium cordifolium, *Roxb. Fl. Ind. ii. 458.*

A diffuse glabrous annual. *Branches* 1-2 ft., slender. *Leaves* petioled, 3-5-nerved from the base, ovate-cordate, elliptic or orbicular, mucronate; *stipules* of several bristles. *Flowers* very small, ¼-½ in. in diam.; pedicels slender. *Bracts* with membranous edges. *Petals* 2-lobed to below the middle, shorter than the sepals. *Stamens* 3-5. *Ovules* 3 or more. *Capsule* ovoid, trigonous, 3-valved to the base. *Seeds* orbicular, compressed, muriculate.

Shady moist ground, common in Dehra Dun, often a weed in gardens. DISTRIB.: Punjab, and throughout Trop. and Sub-trop. India and Ceylon; Himalaya up to 7,000 ft.; Trop. Asia, Africa and America.

7. POLYCARPON, Linn.; Fl. Brit. Ind. i. 244.

Diffuse or dichotomously branched glabrous or pubescent herbs. *Leaves* flat, opposite, appearing whorled from the presence of axillary fascicles of leaves. *Stipules* scarious. *Flowers* small, in crowded many-flowered cymes. *Bracts* scarious. *Sepals* 5, keeled. *Petals* 5 small, hyaline, entire or toothed. *Stamens* 3-5. *Ovary* 1-celled; *style* short, 3-fid; *ovules* numerous.

P. Lœflingiæ, *Benth. & Hk. f. Gen. i, 153*; *F. B. I. i, 245.* Lœflingia indica, *Retz.*; *Roxb. Fl. Ind. i, 165.* Hapalosia Lœflingiæ, *Wall.*; *W. & A. Prod. 358*

An erect or diffuse, glabrous or pubescent annual. *Branches* numerous 4-10 in. *Leaves* cuneate, linear-oblong or spathulate. *Cymes* terminal in the forks. *Flowers* ¼-in. in diam. *Sepals* fleshy, obtusely keeled. *Petals* shorter than the sepals, linear, truncate, apex toothed. *Seeds* many, subcylindric.

A common weed in gardens and waste places. DISTRIB.: Throughout the hotter parts of India; also in Africa.

8. POLYCARPÆA, Lamk.; Fl. Brit. Ind. i. 245.

Annual or perennial, usually erect herbs. *Leaves* flat, opposite, or appearing whorled from the presence of axillary fascicles of leaves; *stipules* scarious. *Flowers* many, in effuse or contracted or capitate cymes. *Sepals* 5, scarious and often coloured. *Petals* 5, entire, 2-toothed or with erose margins. *Stamens* 5, subperigynous, free or cohering together and with the petals into a tube. *Ovary* 1-celled; *style* slender, 3-fid. or-dentate; *ovules* many. *Capsule* 3-valved. *Seeds* obovoid or compressed.

P. corymbosa, *Lamk. Ill. ii, 129*; *W. & A. Prod. 358*; *D. & G. Bomb Fl. 6*; *F. B. I. i, 245*; *Watt E. D.* P. spadicea, *Lamk.*; *W. & A. lc.* Celosia corymbosa, *Retz.*; *Roxb. Fl. Ind. i, 681.*

An erect or procumbent annual or perennial herb, 6-12 in., much dichotomously branched, hoary-tomentose or glabrescent. *Leaves* ¼-1 in., sessile, narrowly linear, mucronate. *Flowers* many, ⅛ in. in diam., crowded on the much-branched cymes, forming large flat-topped silvery heads. *Bracts* scarious, bristle-pointed. *Sepals* much exceeding the capsules, linear-lanceolate, not keeled, very acute, silvery and often veined with red. *Petals* much shorter than the sepals. *Capsule* very small, shining, brown.

Common on sandy and rocky ground, flowering during the greater part of the year. DISTRIB.: Throughout India, ascending the Himalaya up to 7,000 ft.; also in Ceylon and Burma.

XVI.—PORTULACEÆ.

HERBS, rarely undershrubs. *Leaves* opposite or alternate, entire; nodes with scarious or hairy appendages, rarely naked. *Sepals* 2, imbricate. *Petals* 4-5, hypogynous or perigynous, free or united below, fugacious. *Stamens* 4-many, inserted with or upon the petals; *filaments* slender; *anthers*, 2-celled. *Ovary* free or ½-inferior, 1-celled; *styles* 2-8-fid; *ovules* 2-many. *Capsule* with transverse or 2-3-valvular dehiscence. *Seeds* 1-many, compressed; embryo curved round the mealy albumen.—About 150 species, chiefly natives of America.

PORTULACA, Linn.; Fl. Brit. Ind. i. 246.

Diffuse annual or perennial herbs, usually succulent. *Leaves* with scaly or hairy nodal appendages. *Flowers* terminal, surrounded by a whorl of leaves, solitary or clustered. *Sepals* connate below, the free portion deciduous. *Petals* 4-6, perigynous or epipetalous. *Ovary* ½-inferior; *style* 3-8-fid; *ovules* many. *Capsule* crustaceous, dehiscing transversely. *Seeds* many, reniform.

Leaves cuneate-oblong; flowers in terminal clusters . . . . . 1. *P. oleracea.*

Leaves ovate or ovate-lanceolate; flowers terminal, solitary . . . . . 2. *P. quadrifida.*

1. P. oleracea, *Linn. Sp. Pl. 445; Roxb. Fl. Ind. ii, 463; W. & A. Prod. 356; Royle Ill. 221; D. & G. Bomb. Fl. 15; F. B. I. i, 246; DC. L'Orig. Pl. Cult. 69; F. & G. Crops iii, 22, t. xciii; Watt E. D.* Vern. *Kulfa, lunak* (Indian Purslane).

A stout glabrous annual, 6-12 in., with numerous prostrate or ascending branches. *Leaves* ¼-1½ in., alternate, cuneate-oblong or spathulate, truncate or retuse at the apex, thick, pale and glistening beneath, petiole very short; *stipular appendages* minute or 0. *Flowers* sessile, in terminal heads. *Sepals* fleshy, acute, persistent. *Petals* 5, yellow, about as long as

the sepals, very delicate and soon falling. *Stamens* 8-12. *Style* 3-5-fid. *Seeds* many, dark brown, muriculate.

Abundant as a weed in cultivated ground, flowering for the greater part of the year. DISTRIB.: Throughout India, and on the Himalaya up to 5,000 ft. Common in all warm countries. According to DeCandolle this species may be considered to be indigenous in the whole of the region which extends from the W. Himalaya to S. Russia and Greece. A variety with erect stems and brighter green foliage (var. *erecta*, F. B. I. l.c.) is largely cultivated in native gardens as a potherb during the rainy season. The plant is well-known in India for its medicinal properties.

2. **P. quadrifida,** *Linn. Mant. i, 73; Roxb. Fl. Ind. ii, 464; Royle Ill. 221; D. & G. Bomb Fl. 15; F. B. I. i, 217; Watt E. D.*; P. meridiana, *Linn.*; *Roxb. l.c.* 463. P. geniculata, *Royle l.c.*

A prostrate annual, with numerous slender glabrous stems rooting at the nodes. *Leaves* ¼ in. long, opposite, sessile, flat, ovate or ovate-lanceolate, very fleshy. *Stipular appendages* a ring of long white hairs. *Flowers* solitary, terminal, surrounded by a 4-5-leaved involucre and long silky hairs. *Calyx* ½-immersed in the extremity of the axis. *Petals* 4, yellow. *Stamens* about 8. *Style* filiform, 4-fid. *Seeds* twice as large as those of *P. oleracea*.

A common weed throughout the area. In dry places it becomes very stunted, with the stipular hairs long and shaggy. DISTRIB.: Common all over India; also in Trop. Asia and Africa. It is much used as a potherb by the poorer classes, and is occasionally cultivated. Its flowers open at noon and close again at 2 P.M.

XVII.—TAMARISCINEÆ.

SHRUBS or small trees. *Leaves* alternate, minute, often scale-like, exstipulate, rarely sheathing, sometimes fleshy and impressed-punctate. *Flowers* solitary or in spiked or panicled racemes, regular, rarely 1-sexual. *Sepals* and *petals* 5, rarely 4, imbricate, free or connate below. *Anthers* versatile. *Disk* hypogynous or subperigynous, 10-glandular. *Ovary* free, 1-celled, or imperfectly septate; *styles* 2-5, free or connate, or stigmas 3-5, sessile; *ovules* 2-many on each basal placenta. *Capsule* 3-valved. *Seeds* erect, plumed or winged, with or without albumen.

TAMARIX, Linn.; Fl. Brit. Ind. i. 248.

Leaves scale-like, amplexicaul or sheathing. *Flowers* in lateral or terminal spikes or dense racemes, white or pink. *Stamens* 4, 5, 8 or 10; *anthers* apiculate. *Disk* more or less lobed. *Ovary* narrowed

upwards; *styles* 3-4, short; *placentas* basal; *ovules* many. *Seeds* with a sessile plume of hairs; albumen 0.—Species about 64.

Stamens 5—
- Leaves not sheathing; flowers 2-sexual, in large panicles of slender spikes. . 1. *T. gallica.*
- Leaves, sheathing—
  - Flowers dicœcious, in dense cylindrical spikes . . . . . 2. *T. dioica.*
  - Flowers 2-sexual or monœcious, in lax racemose panicles; leaves & sheaths impressed-punctate . . . 3. *T. articulata.*

Stamens 10 . . . . . 4. *T. ericoides.*

1. T. gallica, *Linn. Sp. Pl. 270; W. & A. Prod. 40;* T. gallica, *var.* indica, *Willd. (sp.); F. B. I. i, 248; Brand. For. Fl. 20, t. v; Watt E. D.* T. indica, *Kœn.; Roxb. Fl. Ind. ii, 100 (excl. syn.); Royle Ill. 213.* Vern. *Jhau* (Tamarisk).

A bush, or small tree up to 30 ft. high. *Branches* slender, articulated. *Leaves* minute, persistent, at first imbricated, afterwards distant, not sheathing, subulate, usually green. *Flowers* very small, numerous, shortly pedicelled, closely packed on the long very slender spike-like branches of large terminal panicles, white or pink. *Bracts* shorter than the flowers, semi-amplexicaul, membranous, acute. *Sepals* triangular, obtuse, persistent. *Petals* much longer than the sepals *Stamens* 5; *filaments* twice the length of the petals. *Glands of disk* 10, more or less coalescing in pairs. *Ovary* sub-trigonous, nearly sessile; *styles* 3, slightly connate. *Capsule* ¼ in., attenuated from an ovoid base.

Abundant within the area, in sandy and gravelly ground near rivers, also on low-lying saline ground, often associated with *Salvadora.* DISTRIB.: Throughout India, from the N. W. Himalaya to Burma and Ceylon; W. and S. shores of Europe, N. and Trop. Africa and S. Asia. Flowers in July and August. A glaucous variety, *T. Pallasii,* Desv. (sp.), occurs in W. Tibet up to 12,000 ft.

2. T. dioica, *Roxb. Hort. Beng. 22; Fl. Ind. ii, 101; W. & A. Prod. 40; Royle Ill. 213 F. B. I. i, 249; Brand. For. Fl. 22, t. vi.; Watt E. D.* Vern. *Lál jhau.*

Usually a moderate-sized shrub, 6-7 ft. high, with long spreading or drooping branches. *Leaves* minute, closely appressed, greyish-green, with a broad white margin; apex obliquely deltoid, acuminate. *Flowers* dicœcious, purple or rose-coloured, in compact cylindrical loosely panicled spikes. *Bracts* nearly as long as the flowers, triangular, reddish-brown, with white margins. *Petals* oblong, emarginate. MALE fl.: *Stamens* 5, inserted in the notches of the 5-lobed disk, longer than the petals; *anthers* purple. FEM. fl.: *Stamens* abortive. *Styles* 3, longer than the petals. *Capsule* oblong, tapering, surrounded by the withered sepals and petals, and about twice their length.

Abundant on the banks of rivers, and on low-lying moist ground, especially where the soil is saline. Flowers May to July. Usually a smaller shrub than *T. gallica*, and with a lighter-tinted foliage. A kind of manna (*maki*) produced on this plant by the puncture of an insect, is used in Sindh for confectionary.

3. **T. articulata**, *Vahl Symb. Bot. ii, 48, t. 32; Brand. For. Fl. 22, t. vii; F. B. I. i, 249; Watt E. D.* Vern. *Frásh.*

A moderate-sized coniferous-looking tree, attaining sometimes 60 ft. in height, with an erect trunk and spreading articulated branches forming a close oval head. Foliage, except when young, much more grey and glaucous than that of the two preceding species. It also differs from them by the impressed-punctate glands on its minute sheathing leaves which are often hoary with saline efflorescence. Its flowers are 2-sexual, and sometimes monœcious.

Not known for certain as indigenous within the area of this flora, but it is frequently planted. DISTRIB.: Common in the Punjab and Sindh, and eastward to the Jumna, extending beyond India to Afghanistan, Persia, and N. and Cent. Africa. Flowers May to July. The tree thrives remarkably well on a saline soil.

4. **T. ericoides**, *Rottl. in Gen. Naturf. Fr. Neue. Schr. iv. 214 F. B. I. i, 249; Brand. For. Fl. 572; Watt E. D.* Trichaurus ericoides, *W. & A. Prod. 40; Royle Ill. 214; Camb. in Jacquem. Voy. Bot. 58, t. 70; D. & G. Bomb. Fl. 14.* Vern. *Javra* (Merwára).

A small shrub with slender fastigiate branches. *Leaves* minute, scale-like, sheathing, amplexicaul, ovate-lanceolate, acuminate, without impressed glands. *Flowers* ¼ in. across, in terminal racemes, pale rose-pink. *Stamens* 10, not exceeding the petals, alternately long and short. *Glands of disk* separating the filaments.

Rocky river-beds in Bundelkhand and Merwara. DISTRIB.: Chota Nagpur, Cent. and S. India. It approaches *Myricaria* in habit.

XVIII.—ELATINEÆ.

MINUTE semi-aquatic or terrestrial herbs, or undershrubs. *Leaves* opposite or whorled, entire or serrate, stipulate. *Flowers* small, axillary, solitary or in cymes. *Sepals* and *petals* each 2-5, free, imbricate in bud. *Stamens* as many or twice as many as the sepals, hypogynous, free; *anthers* versatile. *Ovary* free; *cells* and *styles* 2-5; *stigmas* capitate; *ovules* many, on the inner angles of the cells. *Capsule* septicidal; valves separating from the axis and septa. *Seeds* straight or curved; albumen scanty or 0.

BERGIA, Linn.; Fl. Brit. Ind. i. 251

Annuals or undershrubs, erect, decumbent, or diffusely branched. *Leaves* opposite, usually serrate. *Flowers* solitary, or in more or

less dense axillary fascicles, minute, usually 5-merous. *Sepals* acute. *Stamens* 3-5, or 10. *Ovary* ovoid. *Capsule* subcrustaceous, septicidal or septifragal.

Woody, stamens 10.	
Glandular-pubescent . . .	1. *B. odorata.*
Nearly glabrous	2. *B. æstivosa.*
Annual, erect ; stamens 5 . . .	3. *B. ammannioides.*
A glabrous procumbent aquatic herb, stamens 10	4. *B. verticillata.*

1. B. odorata, *Edgew. in Journ. As. Soc. Beng. vii, 765 ; F. B. I. i, 251.* Elatine odorata, *Edgew. ; D. & G. Bomb. Fl. 14.*

A small glandular-pubescent shrub, about 1 ft. high, with papery deciduous bark. *Leaves* sessile, elliptic or ovate, margins crenate-serrate and often reflexed. *Flowers* ⅛ in., in fascicles, pedicelled. *Sepals* 5, ovate, serrulate, herbaceous. *Petals* obovate. *Stamens* 10 ; *filaments* dilated below. *Ovary* grooved ; *styles* 5, ½ the length of the ovary. *Capsule* 5-celled. *Seeds* many, minute, shining, slightly curved.

Merwara. DISTRIB.: Plains of Punjab and Sindh ; Trop. Africa and Egypt. The plant has a scent like that of *Chamomile.*

2. B. æstivosa, *Steud Nom. ed. II, i, 198; W. & A Prod. 41 ; F. B. I. i, 251.*

A small glabrous much-branched shrub ; branches slender, divaricate. *Leaves* narrowly obovate or oblong, almost linear on the flowering branches, faintly serrate. *Flowers* solitary, or 2-4 together, pink. *Sepals* lanceolate, acute, denticulate, with membranous margins.

Banks of the Chambal (Munro). DISTRIB.: Punjab Plain. Perhaps only a variety of the preceding, but different in habit.

3. B. ammannioides. *Roxb. Hort. Beng.; Fl. Ind. ii, 457; W. & A. Prod. 41 ; D. & G. Bomb. Fl. 14 ; F. B. I. i, 251.*

An annual, 3-12 in. high, erect or with the lower branches decumbent, smooth or thinly hispid, the hairs on the stem often glandular. *Leaves* ¼-¾ in. long, sessile, linear-lanceolate or oblanceolate, acute, tapering below, sharply serrate. *Flowers* small, in dense subverticillate fascicles, sessile or nearly so. *Sepals* 5, lanceolate, denticulate. *Petals* and *stamens* 5. *Ovary* oblong, deeply grooved. *Capsule* usually 5-celled ; valves with incurved edges, dehiscing from a central axis. *Seeds* many, ovoid.

Abundant in wet places. DISTRIB.: Throughout India, extending to Afghanistan, Persia, Trop. Africa and Australia. A trimerous variety occurs in S. India and Ceylon.

4. B. verticillata, *Willd. Sp. Pl. ii, 770 ; Roxb. Fl. Ind. ii, 456 ; W. & A. Prod. 41 ; Royle Ill. 77 ; D. & G. Bomb. Fl. 14 ; F. B. I. i, 252.*

A glabrous rather succulent aquatic herb. *Stems* procumbent, rooting, 6-12 in. long. *Leaves* 1-1½ in., spreading, elliptic-lanceolate, acute, faintly crenate-serrate. *Stipules* 5, narrowly deltoid, acute, toothed. *Sepals* 5, narrowly lanceolate, obliquely acuminate, midrib herbaceous. *Petals* 5. *Capsule* globose, ovoid. *Seeds* minute, slightly curved, ribbed and transversely rugose.

Agra District, in marshy ground (Munro). DISTRIB.: S. India, Ceylon, Burma; widely spread in tropical countries.

XIX.—TERNSTRŒMIACEÆ.

SHRUBS rarely climbing, or trees. *Leaves* alternate, simple, usually coriaceous, exstipulate. *Flowers* axillary, usually subtended by 2 sepal-like bracts, 1 or more together, rarely in lateral or terminal racemes or panicles. *Sepals* and *petals* usually 5, free or connate below. *Petals* imbricate or contorted, free or connate below. *Stamens* few or many, free or connate, usually adnate to the base of the deciduous corolla; *anthers* basifixed or versatile, dehiscing by slits or terminal pores. *Ovary* usually free, sessile, 3-5-celled; *styles* as many, free or connate; *ovules* 2-many in each cell, rarely solitary. *Fruit* a berry or capsule. *Seeds* few or many; albumen scanty or 0.—Rare in temperate regions, abundant in tropical Asia and America.

The Tea plant (*Camellia theifera*, Griff.) was introduced into Dehra Dun in 1844, and since that date the industry has been carried on with varying success. For particular information regarding the discovery of the wild Tea plant in Assam, and the history of tea cultivation in India up to recent times, reference should be made to Dr. Watt's "Dictionary of the Economic Products of India."

Saurauja napaulensis, DC, a small tree with prominently penniveined serrate leaves and panicles of pink flowers, has been found as low down as Sahansadhára in Dehra Dun. It occurs on the outer Himalayan ranges, usually in damp shady valleys, up to 7,000 ft., from Garhwal eastward to Bhutan.

EURYA. Thunb.; Fl. Brit. Ind. i. 284.

Shrubs. *Leaves* glabrous, usually crenate-serrate. *Flowers* small, dioecious, sessile or shortly pedicelled, in axillary fascicles, rarely solitary; bracteoles persistent. *Sepals* 5. *Petals* 5, united at the base. *Stamens* 15 or less, rarely 5; *anthers* glabrous. *Ovary* 3-celled; *styles* 3, free or united; *ovules* many, attached to the inner angle of each cell, *Fruit* a berry; albumen fleshy.

E. symplocina, *Blume Mus. Bot. ii, 114; F. B. I. i, 284.*

A slender shrub. *Branches* striate, silky at the apex. *Leaves* 3-5 in. long, oblong, elliptic, entire or serrate towards the apex, obtusely

acuminate, papery; midrib with appressed pubescence; petioles ¼ in. *Flowers* in rather crowded fascicles, peduncles 3-bracteolate, silky. *Sepals* silky outside. *Styles* united.

Dehra Dun, in shady ravines. DISTRIB.: Sub-trop. Himalaya up to 7,000 ft., from Garhwal to Mishmi; also in Java.

XX.—DIPTEROCARPEÆ.

TREES, rarely climbing shrubs, usually resinous. *Leaves* alternate, simple, penniveined, usually entire. *Stipules* persistent or caducous. *Flowers* in axillary and terminal racemes or panicles. *Calyx*-tube campanulate, free or adnate to the torus or ovary. *Petals* contorted, connate at the base or free. *Stamens* usually many, inserted on the torus, or adnate to the petals. *Ovary* slightly immersed in the torus, usually 3-celled; *ovules* 2 in each cell, rarely solitary. *Fruit* capsular or nut-like and 1-seeded, tightly inclosed in the enlarged calyx, of which 2 or more of its lobes are often developed into conspicuous wings. *Seeds* usually without albumen.—The majority of the species are confined to Trop. E. Asia.

SHOREA. Roxb.; Fl. Brit. Ind. i. 303.

Glabrous, mealy or pubescent resinous trees. *Leaves* entire or subrepand, penniveined, with the intermediate reticulations often inconspicuous. *Stipules* large, coriaceous, persistent, or minute and fugacious. *Flowers* in axillary or terminal lax cymose panicles. *Bracts* persistent, caducous or 0. *Calyx*-tube very short, adnate to the receptacle; segments imbricate. *Stamens* 15 or 20 to 100; *anthers* usually with a subulate-cuspidate connective. *Ovary* 3-celled; cells 2-ovuled; *style* subulate; *stigma* entire or 3-toothed. *Fruit* coriaceous, indehiscent, usually 1-seeded, closely surrounded by the bases of the accrescent calyx-segments, 3 or all of which are developed into large prominently-veined wings. *Cotyledons* fleshy, unequal.—Natives of Tropical Asia and the Indian Archipelago.

S robusta. *Gærtn. f. Fruct. iii, 49. t. 186; Roxb. Fl. Ind. iii, 615; Royle Ill. 105; F. B. I. i, 306; Brand. For. Fl. 26; Watt E. D.* Vern. *Sál* (The Sál tree).

A large tree. Young branches, petioles, young leaves and inflorescence hoary or pubescent. *Leaves* 6-10 in. long, broadly ovate from a rounded or cordate base, more or less bluntly acuminate, entire, glabrous and shining; lateral nerves about 12 pairs; petiole ¼ in.; *stipules* ½ in., falcate, pubescent, caducous. *Flowers* yellowish, shortly stalked,

unilateral on the racemose branches of axillary panicles. Calyx and outside of petals clothed with soft grey pubescence. *Calyx*-segments (in fruit) enlarged into five unequal oblong or spathulate wings 3-4 in. long, contracted above the base. *Petals* (at the flowering time) four times as long as the calyx, orange-coloured inside. *Stamens* 25-30 or more; *anthers* pilose at the apex. *Ovary* pubescent; *style* subulate; *stigma* 3-denticulate. *Fruit* ovoid, acuminate, ½ in. long, hoary.

The distribution of sál forests in India takes the form of two irregular belts separated by the Gangetic Valley. The northern or Sub-Himalayan tract extends from Assam, skirting the base of the hills through Northern Oudh, Rohilkhand, Dehra Dun and the Siwalik range as far as the Kangra Valley in the Punjab, ascending here and there to 3,000 ft. The second or Central Indian belt extends from the Western Bengal hills to the Pachmarhi plateau and southward to the Godavery and Northern Circars. The average height of this tree is from 60-90 ft., with a girth of 6-8 ft.; but under favourable conditions, as in the Nepal Terai, a height of 100-150 ft. is sometimes reached, and with a girth of 20-25 ft. The flowers appear in March with the young foliage, and the seeds ripen in June. As a timber tree the sál is extremely valuable, the wood being strong, elastic and durable. Large quantities of a whitish aromatic resin exude from this tree when tapped; it is used for caulking boats, and also in the form of incense. Regarding other useful properties Dr. Watt's Dictionary should be consulted.

XXI.—MALVACEÆ.

HERBS, shrubs, or soft-wooded trees, with tenacious inner bark, and usually mucilaginous juice; herbaceous portions generally stellate-hairy. *Leaves* alternate, palminerved, rarely compound. *Stipules* free, often caducous. *Bracteoles* 3 or more, rarely 0, scattered or in a whorl, free or combined. *Flowers* axillary or terminal, solitary fascicled or cymose-paniculate, regular, hermaphrodite or 1-sexual, (polygamous in *Kydia*). *Sepals* 5, valvate, free or connate. *Petals* 5, twisted, imbricate. *Stamens* many, rarely definite, adnate to the base of the petals; *filaments* monadelphous rarely 5-adelphous, usually forming a tube; *anthers* ultimately 1-celled, bursting longitudinally. *Ovary* 2-many-celled, entire or lobed, of 2-5 or more carpels surrounding a central axis; *styles* connate below or for their whole length; *stigmas* linear or capitate; *ovules* 1 or more, attached to the inner angle of each carpel. *Fruit* of dry indehiscent or dehiscent cocci, or capsular and loculicidal. *Seeds* reniform or obovoid, glabrous hairy or woolly; albumen scanty or 0; embryo curved; cotyledons folded or crumpled.—This family, which contains over 700 species, is largely represented in India.

Many of the species, by reason of their mucilaginous properties, afford wholesome food-products, and are also used medicinally. The inner

tenacious bark of others, such as species of *Hibiscus*, *Sida*, *Abutilon*, and *Malachra* can be worked into valuable fibre-material. The most important, however, are the cotton-yielding species of *Gossypium*. *Adansonia digitata*, L., the 'Baobab' of Tropical Africa, is frequently grown in the gardens of Upper India. To this family also belongs the *Durian* tree (Durio Zibethinus, Murr.), a native of the Malay Islands.

Staminal-tube entire, or slightly divided at the apex.
Herbs or shrubs rarely trees.
Ripe carpels separating from the axis.
Styles as many as the carpels.
Carpels 1-seeded.
Stigmas linear.
Bracteoles 6-9 . . . . . 1. ALTHÆA.
Bracteoles 3 . . . . . 2. MALVA.
Stigmas capitate.
Bracteoles 3 . . . . . 3. MALVASTRUM.
Bracteoles 0 . . . . . 4. SIDA.
Carpels 2- or more-seeded,
Bracteoles 0 . . . . . 5. ABUTILON.
Styles twice as many as the carpels.
Carpels opp. the petals.
Bracteoles many, scattered amongst the crowded flowers . . . . 6. MALACHRA.
Bracteoles 5 . . . . . 7. URENA.
Carpels opp. the sepals . . . 8. PAVONIA.
Fruit capsular.
Stigmas spreading.
Ovary 10-celled, bracteoles 10 . . . 9. DECASCHISTIA.
Ovary 5-celled.
Bracteoles 3, cordate . . . . 10. SENRA.
Bracteoles 5 or more or 0 . . . 11. HIBISCUS.
Sigmas connate.
Bracteoles 5, minute, deciduous . . 12. THESPESIA.
Bracteoles 3, large, persistent . . . 13. GOSSYPIUM.
Staminal-tube dividing above into 5 bundles of stamens. Trees.
Leaves simple, bracteoles 4-6, capsule 3-valved 14. KYDIA.
Leaves digitate bracteoles 0, capsule 5-valved . 15. BOMBAX.

1. ALTHÆA, Linn.; Fl. Brit. Ind. i. 319.

Herbs, pubescent or villous, erect or decumbent. *Leaves* more or less deeply divided. *Flowers* pedunculed, axillary, solitary or fascicled, or in terminal racemes. *Bracteoles* 6-9, connate at the base. *Ovary* many-celled; *styles* as many as the carpels, filiform, inner surfaces stigmatose; *ovules* 1 in each cell. *Carpels* numerous, ultimately separating from the short torus. *Seeds* solitary in each carpel, ascending.

A. rosea, L., is the common Holly-hock, often cultivated in Indian gardens. *A. officinalis*, L. (Marsh Mallow) is found wild in Kashmir.

A. Ludwigii, *Linn. Mant. 98*; *F. B. I. i, 319.* Malva malwensis, *Edgew.*

A slender branching hispid annual. *Stems* 6-12 in. high, prostrate or ascending. *Leaves* long-petioled, orbicular, deeply 5-7-lobed, lobes wedge-shaped, 3-fid. *Bracteoles* 7-9, as long as the calyx. *Flowers* shortly pedunculed, few or in clusters, ½-¾ in. in diam., whitish. *Petals* exceeding the lanceolate sepals. *Carpels glabrous, wrinkled at the sides.*

Agra dist. (Munro), Bundelkhand (Edgeworth). DISTRIB.: Punjab, Sindh, Baluchistan; westward to the Mediterranean; also in S. Africa.

2. MALVA, Linn.; Fl. Brit. Ind. i. 320.

Downy herbs. *Leaves* lobed. *Flowers* in axillary tufts. *Bracteoles* 3, distinct. *Sepals* 5, connate at the base. *Petals* emarginate, connate at the extreme base. *Staminal*-tube antheriferous to the top, without sterile teeth. *Ovary* many-celled; *styles* as many as the carpels; *stigmas* linear; *ovules* 1 in each cell. Ripe *carpels* 1-seeded, indehiscent, separating from a short conical torus. *Seed* solitary, ascending.—Temperate regions of the Old World. Some of the species have become widely diffused as weeds of cultivation.

Erect herbs.

Corolla about twice the length of the calyx	1. *M. verticillata.*
Corolla 3-4 times the length of the calyx	2. *M. sylvestris.*
A procumbent herb. corolla scarcely longer than the calyx	3. *M. parviflora.*

1. M. verticillata, *Linn. Sp. Pl. 689*; *F.B.I. i, 320*; *Watt E. D.*

An erect branching pubescent annual or perennial, 2-4 ft. high. *Leaves* suborbicular, 5-6-lobed, cordate, downy. *Flowers* small, nearly sessile, in dense axillary clusters. *Bracteoles* linear. *Calyx*-lobes deltoid-lanceolate. *Petals* notched, about twice as long as the calyx. *Carpels* 10-12, inclosed within the accrescent calyx, reticulate at the sides, prominently ribbed on the back.

Kheri dist., Oudh, Merwára. DISTRIB.: Punjab Plain and Rajputana; throughout the Himalaya up to 12,000 ft.; Nilgiris; also in Abyssinia, Egypt, Europe and China. The leaves and tender shoots are sometimes cooked and eaten as spinach.

2. **M. sylvestris**, *Linn. Sp. Pl. 689, var.* mauritiana, *F. B. I. i., 320.* M. mauritiana, *Linn.; Roxb. Fl. Ind. iii, 181; W. & A. Prod.* 45.

An erect glabrous annual, 3-5 ft. high. *Leaves* cordate, rounded, with 5-7 obtuse lobes; petioles as long as the leaves: stipules oval, acute. *Peduncles* several, axillary, much shorter than the petioles. *Flowers* 1-1½ in. in diam., pale rose streaked with purple. *Petals* notched; claw bearded. *Carpels* wrinkled on the back, glabrous.

Kheri dist., Oudh; Etawah and Agra districts. DISTRIB.: Bengal and South India. Frequently grown in native gardens, and used as a potherb and medicinally. Flowers in cold season. Typical *M. sylvestris* is found in the Punjab, and on the W. Himalaya, extending westward to Europe and North Africa, also to Siberia.

3. **M. parviflora**, *Linn. Diss. Dem. Pl. Nov. Amœn. Acad. iii, 416; F. B. I. i, 321. Watt E. D.*

A small spreading herb, slightly downy. *Leaves* roundish, obsoletely 5-7 lobed. *Peduncles* short, spreading after flowering. *Bracteoles* linear. *Sepals* accrescent. *Petals* notched, hardly exceeding the sepals; claw glabrous. *Carpels* wrinkled.

A common weed in rich soil, flowering during the cold season. DISTRIB.: Bengal, Sindh, Punjab; extending through Afghanistan to Europe and Arabia. Frequently eaten as a potherb in times of scarcity.

3. MALVASTRUM, A. Gray; Fl. Brit. Ind. i. 321.

Herbs or undershrubs. *Leaves* entire, or divided. *Inflorescence* axillary or terminal. *Bracteoles* 3, narrow. *Calyx* 5-parted. *Petals* longer than the sepals. *Staminal*-tube antheriferous to the summit, with no sterile teeth. *Ovary* 5-or more-celled; *styles* as many as the carpels; *stigmas* capitate. Ripe *carpels* separating from a short torus, indehiscent, 1-seeded, beaked or not. *Seed* ascending.

M. triouspidatum, *A. Gray., Pl. Wright i, 16; F. B. I. i, 321.*

An erect branching herb, 2-3 ft high; hairs simple. *Leaves* ovate-lanceolate, irregularly toothed; petiole 1¼ in. *Peduncles* ¼-½ in. *Calyx* campanulate; lobes triangular, acute. *Petals* yellow. *Carpels* 8-10, reniform, with 3 projecting points.

A common weed in cultivated ground, but not indigenous. DISTRIB.: Bengal, Madras, and tropics of both hemispheres.

4. SIDA, Linn.; Fl. Brit. Ind. i. 322.

Perennial herbs or undershrubs. *Leaves* simple, often lobed. *Bracteoles* 0. *Sepals* 5, valvate, tubular beolw. *Petals* 5, free

above, connate below and adnate to the tube of the stamens. *Staminal*-tube dividing at the summit into numerous anther-bearing filaments. *Carpels* 5—10; *styles* as many as the carpels; *stigmas* terminal. Ripe *carpels* separating from the axis, generally 2-awned at the summit, and dehiscing irregularly or by a small chink. *Seed* solitary, pendulous. Species about 70, mostly tropical.

A procumbent trailing herb . . . . 1. *S. veronicæfolia.*

Small erect shrubs.

With recurved spines below the petioles . 2. *S, spinosa.*

Without spines.

Awns short.

Leaves narrowly lanceolate, glabrous or nearly so . . . . . 3. *S. acuta.*

Leaves rhomboid-lanceolate or obovate, hoary beneath . . . 4. *S. rhombifolia.*

Leaves downy on both surfaces . 5. *S. grewioides.*

Awns exceeding the calyx, leaves cordate-oblong, downy on both surfaces . . . . . 6. *S. cordofolia.*

1. S. veronicæfolia, *Lamk. Encycl. i, 5.*; S. humilis, *Wild.*; *Roxb. Fl. Ind. iii, 171; W. & A. Prod.45; Royle Ill. 83; D & G. Bomb. Fl. 17; F. B. I. i, 322; Watt E. D.*

A perennial trailing herb clothed with scattered radiating hairs. *Leaves* ½–2 in. long, broadly ovate or suborbicular, cordate, acute or shortly acuminate, crenate-serrate, slightly hairy; petiole shorter than the blade, *Flowers* pale yellow, less than ½ in. in diam., axillary, solitary or in pairs, distant or arranged in loose racemes, peduncles jointed at or above the middle. *Calyx* 5-angled; segments triangular, acute. Petals exceeding the calyx, broad, truncate. *Carpels* 5, smooth, shortly mucronate or bicuspidate.

Common throughout the area. DISTRIB.: Hotter parts of India; also in tropical Africa and America. The leaves are medicinal; the plant is also used as a potherb.

2. S. spinosa. *Linn. Sp. Pl. 683; F. B. I., i, 323; (excl. syn. S. almifolia L.); Watt E. D.* S. alba, *Linn.*; *Roxb., Fl. Ind. iii, 174, W. & A. Prod. 58; D. & G. Bomb. Fl. 17.*

A small erect shrub. Stems rough with minute stellate hairs, usually with recurved spiny tubercles at the nodes below the petioles. *Leaves* ½-2 in. long, very variable, ovate or obovate, obtuse or retuse, 3-nerved, cordate or truncate at the base, crenate-serrate, glabrous above, finely stellate-pubescent beneath; stipules subulate. *Peduncles* ½-¾ in., jointed near the top. *Flowers* ½ in. across, white. *Calyx* hairy; segments triangular, acute. Ripe *carpels* 5, with 2 long erect rough beaks, equalling the calyx.

Common within the area. DISTRIB.: Hotter parts of India, and throughout the tropics. The roots and leaves are used medicinally.

3. S. acuta. *Burm. f. Fl. Ind. 147; Roxb. Fl. Ind. iii, 171; W. & A. Prod. 57; D. & G. Bomb. Fl. 17.* S. carpinifolia, *Linn.; F. B. I. i, 323; Watt E. D.* S. lanceolata, *Roxb. l. c. 175.* S. stipulata, *Cav.; W. & A. Prod, 57.*

A small much-branched undershrub. *Branches* smooth or slightly rough with minute stellate hairs. *Leaves* 1-3 in. long, lanceolate-oblong, rounded at the base, acute or obtuse, serrate or crenate-serrate, glabrous, pale beneath; *stipules* linear-subulate, longer than the petioles, veined, ciliate. *Peduncles* jointed near the middle, equalling the petioles. *Calyx*-tube subglobose; segments triangular, acute, nearly glabrous. *Corolla* twice as long as the calyx, yellow. *Carpels* 5-10, rugose 2-awned.

Common within the area; flowering during the latter part of the rainy season. DISTRIB.: Throughout the hotter parts of India, and other tropical parts of the world. The stems yield a good fibre, and various parts of the plant are used medicinally.

4. S. rhombifolia, *Linn. Sp. Pl. 684; Roxb. Fl. Ind. iii, 176; Royle Ill. 84; F. B. I. i, 323, Watt E. D.*

A small erect undershrub. *Branches* rough with stellate hairs. *Leaves* 1-2 in. rhomboid-lanceolate or obovate, acute, glabrous or slightly hairy above, more or less stellate-hairy beneath; margin entire towards the base, dentate-serrate above; *stipules* linear-setaceous, longer than the petiole. *Peduncles* axillary or clustered at the ends of the branches. *Flowers* ¼-½ in. in diam., yellow or white. *Sepals* deltoid, acute or acuminate. *Carpels* 10, with short or long beaks.

Very common within the area. DISTRIB.: Throughout India, and in the tropics of both hemispheres. This species varies greatly as to the shape of the leaves, the relative length of the peduncle, and position of the joint, also in the length of the carpellary awns. Of the five varieties described in the Fl. Brit. Ind., the two following are found in the Upper Gangetic Plain.

VAR. 1. rhomboidea; *Roxb. Hort. Beng. 50; Fl. Ind. iii, 176 (sp.); W. & A. Prod. 57; Watt E. D. Leaves* rhomboid-lanceolate, serrate, hoary beneath. *Peduncles* more than half the length of the leaves, jointed at the base. *Flowers* usually collected in leafy corymbs at the ends of the branches. Awns of carpels very short and inflected. Roxburgh mentions that the flowers open at noon.

VAR. 2. obovata, *Wall. Cat. 1864 (sp.); Watt E. D. Leaves* large, broadly obovate, hoary beneath, apex coarsely toothed, base cuneate *Peduncle* longer than the petiole, but shorter than the blade.

5. S. grewioides. *Guill. & Perr. Fl. Seneg. Tent. i. 71; F. B. I. i. 323.*

A cano-tomentose undershrub. *Leaves* about ½ in. long, oblong-ovate, obtuse, crenate, downy on both surfaces; petiole shorter than the blade; *stipules* linear, subulate, nearly as long as the petiole. *Peduncles* solitary or twin, shorter than the petioles. *Flowers* small, yellow or white.

Calyx-tube angular. *Carpels* 7-8, shortly awned, wrinkled, indehiscent or nearly so, beaks connivent.

Etawah dist. DISTRIB.: Punjab, Sindh and Baluchistan; extending to Arabia and Tropical Africa.

6. S. cordifolia, *Linn. Sp. Pl. 684; Roxb. Fl. Ind. iii, 177; W. & A. Prod. 58; Royle Ill. 83; D. & G. Bomb. Fl. 17; F. B. I. i. 324; Watt E. D.*

A small erect downy shrub, with long spreading hairs on the branches and petioles. *Leaves* 1-2 in. long, cordate, oblong, obtuse, crenate, downy on both surfaces; *petiole* about as long as the blade; *stipules* linear, shorter than the petiole, deciduous. *Peduncles* solitary, jointed near the flower; lower ones distant and longer than the petiole, upper very short and crowded. *Flowers* small, yellow. *Calyx*-segments triangular, acute. *Carpels* 10-awned, reticulated on the sides; awns longer than the calyx, covered with stiff reflexed hairs.

A common weed, flowering during the rains and cold season. DISTRIB.: Throughout the hotter parts of India, and the tropics generally. This plant also yields a good fibre, and possesses medicinal properties similar to those of the other species.

5. ABUTILON, Gærtn.; Fl. Brit. Ind. i. 325.

Herbs or undershrubs, more or less downy. *Leaves* angled or palmately-lobed. *Inflorescence* axillary or terminal. *Bracteoles* 0. *Sepals, petals* and *stamens* as in *Sida*. *Carpels* 5-many. *Styles* as many as the carpels. Ripe *carpels* separating from the axis, awned or not, 2- or more-seeded. *Seeds* reniform, upper ascending, lower descending. Species about 80, all tropical or sub-tropical.

This genus is closely allied to *Sida*, but it differs in habit, and by the larger flowers which usually open in the evening, whilst those of the *Sidas* expand about noon.

Carpels 15 or more.	
Carpels hispid, with short erect awns; leaves hairy and rugose above	1. *A. asiaticum.*
Carpels glabrescent, with short sharp spreading beaks; leaves densely tomentose on both surfaces	2. *A. indicum.*
Carpels without awns; branches gland-pubescent	3. *A. graveolens.*
Carpels less than 15.	
Carpels about 10, with spreading awns	4. *A. ramosum.*
Carpels 5, with erect awns	5. *A. polyandrum.*

1. A. asiaticum, *G. Don Gen. Syst. i. 503; F. B. I. i. 326 (not of W. & A. Prod.); Watt E. D.* Sida asiatica, L.

Herbaceous or somewhat woody below, densely pubescent. *Leaves* 2-4 in. long, ovate, cordate, acute or acuminate, serrate, slightly hairy and rugose above, velvety and with prominent veins beneath; petioles 1½-1½ in.. *Stipules* linear, deflexed. *Peduncles* stout, longer than the petiole, jointed near the flower. *Flowers* yellow, 2 in. across. *Calyx*-lobes oval, acuminate, 3-veined, ultimately deflexed. Ripe *carpels* about 20, hispid; scarcely longer than the calyx; awns short, erect.

Bundelkhand (Edgeworth). DISTRIB.: C. Prov. to S. India and Ceylon, and in the tropics of both hemispheres. The stems yield a good fibre. Trimen remarks that in Ceylon specimens the ripe carpels are never awned.

2. **A. indicum,** *Sweet Hort. Brit., ed. I, 54; Royle Ill. 83.; F.B.I. i. 326; Watt E. D.* A. asiaticum, *W. & A. Prod. 56 (not Sida dsiatica L.). D. & G. Bomb. Fl. 18.* Sida indica, *Linn.; Roxb. Fl. Ind. iii, 179.*

Annual or perennial. *Leaves* 1-2 in. long, broadly cordate, acute or acuminate, irregularly and coarsely toothed or sub-entire, pale and minutely pubescent on both surfaces, often with a few longer hairs intermixed; petiole usually longer than the blade; *stipules* deflexed. *Flowers* 1 in. in diam., axillary, solitary, their peduncles longer than the petioles and jointed near the top. *Calyx*-lobes shallow, ovate, acute or apiculate. *Corolla* orange-yellow; petals spreading. *Carpels* 15 20, longer than the calyx, with short spreading awns, tomentose at first, afterwards subglabrous. *Seeds* dark brown, minutely stellate-hairy.

A common weed, flowering during the greater part of the year. DISTRIB.: Hotter parts of India and throughout the tropics generally. From the stems a strong fibre is obtained, and various portions of the plant are used medicinally.

VAR. populifolium, *W. & A. l. c.; F. B. I. l. c.* Sida populifolia, *Lamk.; Roxb. l. c.; Royle l. c.*; leaves more or less acuminate.

3. **A. graveolens,** *W. & A. Prod. 56; Royle Ill. 83; F.B.I. i, 327; Watt E. D.* Sida graveolens, *Roxb.; Fl. Ind. iii. 179.* Vern. *Barkanghi, bara banghi* (Cawnpore).

A shrub, 4-6 ft. high. *Branches* covered with minute glandular pubescence mixed with long white spreading hairs. *Leaves* 2-3½ in. long, orbicular-cordate, sometimes lobed, abruptly acuminate, velvety on both sides; petiole almost as long as the blade; *stipules* linear-falcate, reflexed, deciduous. *Peduncles* as long as the petioles, jointed above the middle. *Flowers* large, orange-coloured, with a darker centre, becoming pink when old, ultimately reflexed. *Sepals* ovate, acuminate, densely pubescent. *Petals*, obcordate. *Carpels* 20 or more, rounded, hairy, about as long as the enlarged calyx.

Dehra Dun, Hardwár, Etawáh. DISTRIB.: Baluchistan, Sindh, C. Prov. to S. India and Ceylon; also in Java, Trop. Africa and Australia. A fibre is obtained from the stems, and the roots, leaves and seeds are medicinal. The fresh plant has often a strong and unpleasant smell.

4. **A. ramosum,** *Guill. & Perr. Fl. Seneg. Tent. i, 68; F. B. I. 329.* A. sidoides, *D. & G. Bomb. Fl. 18.*

A small shrub with white bark. *Branches* downy, with a few spreading hairs intermixed. *Leaves* on long stalks, ovate, cordate, acuminate, sometimes 3-cuspidate, crenate-serrate, membranous and green on both surfaces. *Peduncles* axillary and terminal, shorter than the petioles, jointed in the middle. *Flowers* many, small, yellow. *Calyx*-tube broadly cup-shaped; segments ovate, acute. *Petals* twice as long as the sepals. Ripe *carpels* about 10, much exceeding the sepals, hispid and viscid; awns spreading. *Seeds* 3, tubercled.

Bundelkhand (Edgeworth), Guna (King). DISTRIB.: W. India to Trop. Africa.

5. A. polyandrum, *G. Don Gen. Syst. i, 500; W. & A. Prod. 55, D. & G. Bomb. Fl. 17; F. B. I. i, 325; Watt E. D.* Sida polyandra *Roxb.; Fl. Ind. iii, 173.*

An erect annual or perennial herb, up to 6 or 7 ft. high. *Leaves* 4-8 in. long, roundish, cordate, with a long obtuse acumen, repand-dentate, downy especially beneath; petiole 4 in. *Stipules* setaceous, often coloured. *Flowers* in small terminal racemes, subpolyandrous (*Roxb.*); *peduncles* jointed near the top. *Sepals* lanceolate, forming a bell-shaped tube below. *Corolla* 1½ in. across. *Petals* reflexed. *Filaments* free nearly to the base; *Staminal*-tube with a ring of hairs at the top. *Carpels* hispid, exceeding the calyx; awns 5, erect. *Seeds* 3-4.

Saharanpur dist., Bundelkhand (Edgeworth). DISTRIB.: Chota-Nagpur, Pachmarhi, Nilgiris, Sindh; also in Java and in S. Trop. Africa. The stems yield a long silky fibre resembling hemp.

6. MALACHRA. Linn.; Fl. Brit. Ind. i. 329.

Herbs. *Leaves* angled. *Flowers* in dense heads, usually intermixed with bracteoles. *Sepals* 5, forming a cup-shaped tube below. *Petals* 5, coherent below and connate at the base with the tube of the stamens. *Staminal*-tube truncate or 5-toothed; *filaments* numerous. *Carpels* 5, 1-ovuled, opposite the petals.; *styles* 10. Ripe *carpels* indehiscent, separating from the axis, smooth. *Seeds* reniform, ascending.

M. capitata, *Linn. Syst. ed. XII, 458.; F. B .I. i, 329; Watt E. D.* M. rotundifolia, *D. & G. Bomb. Fl. Suppl. 9 (not of Schrank).*

Annual or perennial, coarsely hairy. *Leaves* 5-6 in. wide or less, roundish, angled, cordate, toothed; petioles 4 in.; *stipules* linear. *Flowers* in axillary or terminal heads. *Bracteoles* reniform, with a white spot at the base. *Petals* yellow or white, longer than the subulate sepals. *Fruit* subglobose, depressed.

This plant has become naturalized in certain parts of the area. DISTRIB.: Throughout the hotter parts of India from the North-Western Provinces and Bengal to the Karnatic (introduced). It is found wild in W. tropical Africa and in tropical America. Not having been mentioned by either Roxburgh, Wallich, or Wight, its introduction into India must be comparatively modern. The stems yield a strong soft silky fibre, which has been recommended as a substitute for jute.

7. URENA, Linn.; Fl. Brit. Ind. i. 329.

Herbs or undershrubs, more or less covered with rigid stellate hairs. *Leaves* angled or lobed. *Flowers* clustered. *Bracteoles* 5, adnate to the 5-cleft calyx, sometimes coherent at the base into a cup. *Petals* 5, connate below and united to the base of the truncate or minutely toothed staminal tube. *Anthers* nearly sessile. *Ovary* 5-celled; cells 1-ovuled, opposite the petals; *styles* 10; *stigmas* capitate. Ripe *carpels* covered with hooked bristles or smooth, indehiscent, separating from the axis when ripe. *Seed* ascending.—Species about 5, inhabiting tropical and sub-tropical countries.

Carpels armed with hooked bristles .	1. *U. lobata.*
Carpels smooth, unarmed . . .	2. *U. repanda.*

1. U. lobata, *Linn. Sp. Pl. 692; Roxb. Fl. Ind. iii, 182; W. & A. Prod. 46; Royle Ill. 84; D. & G. Bomb. Fl. 18; F. B. I. i, 329 (excl. syn. U. palmata); Watt E. D.* Vern. *Bachita.*

A tall erect undershrub, 2-4 ft. high. *Stems* and *branches* densely covered with spreading stellate hairs. *Leaves* variable, 2-3 in. long, rounded, ovate or linear-lanceolate, cordate at the base, 5-7 lobed, softly hairy on both surfaces, paler beneath; nerves prominent beneath, the 3 central ones or the midrib only provided with an oval glandular pore; petiole ¼-2 in. long; *stipules* linear. *Bracteoles* oblong, lanceolate, equalling the calyx. *Flowers* ½-1 in., bright pink with a darker centre. *Carpels* rounded on the back, densely stellate-hairy, and with many hooked bristles.

Waste places, very common within the area, flowering during the rainy and cold seasons. DISTRIB.: Hotter parts of India and in the tropics of both hemispheres The bark yields a strong fibre.

2. U. repanda. *Roxb. Hort. Beng. 51; Fl. Ind. iii. 182; W. & A. Prod. 46; F. B. I. i, 330; Watt E. D.* U. palmata, *Roxb. Fl. Ind. iii, 182.*

An erect much-branched perennial herb. *Leaves* shortly stalked, roundish, rarely lobed, rough on the upper surface, midrib glandular at the base beneath; lower 2-2½ in. long, cordate, repand-serrate; upper lanceolate. *Flowers* racemose, ultimately in leafless clusters. *Bracteoles* 5, ¼-½ in., connate below into a strongly ribbed cup, subcoriaceous, exceeding the membranous calyx. *Sepals* united for half their length. *Corolla* pink, twice the length of the bracteoles. *Carpels* smooth, unarmed. *Seed* ascending, smooth.

Dehra Dun, Moradabad, and along the base of the Himalaya; a weed in the Saharanpur garden. DISTRIB.: Punjab, Central Provinces, S. India, and Ava. The root and bark are believed by the Santals to be a cure for hydrophobia.

8. PAVONIA, Cav.; Fl. Brit. i. 330.

Herbs or undershrubs. *Flowers* axillary, solitary or clustered at the ends of the branches. *Bracteoles* 5-15, nearly free. *Sepals* 5.

connate at the base. *Petals* 5, connate below or adnate to the tube of the stamens. *Staminal*-tube truncate or 5-toothed. *Ovary* 5-celled, with 1 ovule in each cell; *styles* 10; *stigmas* capitate. Ripe *carpels* 5, opposite the sepals, indehiscent, or more or less 2-valved, separating from the axis, smooth, sometimes winged; beak 0. *Seed* ascending. Species about 70, mostly tropical American.

P. odorata, *Willd. Sp. Pl. iii, 837; Roxb. Fl. Ind. iii, 214; W. & A. Prod. 47; F. B. I. i. 331; Watt E. D.*

An erect branching annual, 1½-3 ft. high. *Stems* covered with soft viscous pubescence and a few longer hairs. *Leaves* 1-3 in. long, roundish, ovate, cordate, shallowly 3-5-lobed, dentate or the lower ones entire, stellate-hairy on both surfaces, often felted and whitish beneath; lower petioles longer than the blades. *Peduncles* as long as the leaves, 1-flowered, clustered at the ends of the branches. *Bracteoles* 10-12. *Sepals* lanceolate. *Corolla* pale pink or white, twice the length of the calyx. *Carpels* gibbous on their backs, wingless, unarmed, dehiscent.

Bundelkhand. DISTRIB.: Bengal to S. India and Ceylon, Burma; also in E. Trop. Africa. A soft white fibre of excellent quality is obtained from this plant. It is cultivated in gardens for its sweet-scented flowers, and the fragrant roots are used medicinally.

9. DECASCHISTIA, W. & A.; Fl. Brit. Ind. i. 332.

Shrubs. *Leaves* more or less lobed. *Flowers* shortly stalked, axillary, or clustered and terminal. *Bracteoles* 10. *Sepals* 5, connate below. *Petals* 5, connate below and adnate to the tube of the stamens. *Staminal*-tube giving off many filaments below the apex. *Ovary* 10-celled, cells 1-ovuled; *styles* 10, connate below; *stigmas* capitate. *Capsule* loculicidally 10-valved. *Seeds* reniform, ascending. Species 5, of which 2 are confined to India.

D. crotonifolia, *W. & A. Prod. 52; Royle Ill. 83; F. B. I. i, 332.*

Leaves about 4 in. long and 2 in. wide, ovate or slightly lobed, coarsely toothed, velvety on both surfaces with short dense tomentum, whitish beneath, midrib with a glandular pore at the base: petiole 1½ in. *Peduncle* longer than the petiole. *Bracteoles* nearly as long as the calyx. *Calyx*-lobes triangular, acuminate. *Capsule* slightly hispid. *Seeds* glabrous.

Near Delhi (Royle). DISTRIB.: Konkan, Deccan, Mysore.

10. SENRA, Cav.; Fl. Brit. Ind. i. 333.

A downy undershrub. *Leaves* orbicular, 3-lobed. Inflorescence axillary. *Bracteoles* 3, large, membranous, free. *Sepals* 5, lanceolate, connate below. *Petals* 5, connate below. *Staminal*-tube lightly 5-toothed, antheriferous below the summit. *Ovary* 5-celled,

cells 2-ovuled; *styles* 5; *stigma* capitate. *Capsule* loculicidally 5-valved, valves opposite the sepals. *Seeds* reniform, ascending, 1 in each cell.

S. **incana**, *Cav. Diss. ii, 83, t. 35, f 3*; *F. B. I., i, 334.* S. rupestris, *Edgew Cat. Banda Pl. 441.*

Leaves on long stalks, denticulate; *stipules* caducous. *Peduncles* shorter than the petioles, ultimately deflexed. *Petals* obovate, yellow or violet, exceeding the calyx. *Seeds* pilose, black-dotted.

Bundelkhand (Edgeworth). DISTRIB.: Karáchi; also in Arabia, Abyssinia and Nubia. I have seen no specimens from Bundelkhand and there appears to be some doubt regarding Edgeworth's locality.

11. HIBISCUS, Linn.; Fl. Brit. Ind. i. 334.

Herbs, shrubs or trees. *Leaves* stipulate, usually more or less palmately lobed. *Inflorescence* axillary. *Bracteoles* 5 or more, rarely fewer or 0, free or connate at the base. *Calyx* 5-toothed, valvate, sometimes spathaceous and circumsciss. *Petals* 5, connate at the base with the tube of the stamens. *Staminal*-tube truncate or 5-toothed at the summit; *filaments* many; *anthers* reniform. *Ovary* 5-celled, cells opposite the sepals, each with 3 or more ovules; *styles* 5, connate below; *stigma* capitate or subspathulate. *Capsule* loculicidally 5-valved, sometimes with a separate endocarp, or with false dissepiments forming a spuriously 10-celled fruit. *Seeds* glabrous, hairy or woolly. Species about 150, mostly tropical.

The following species are cultivated in many gardens of Upper India:—*H. Rosa-sinensis*, L. (Shoe-Flower), a native of China, where the petals are used to blacken shoes, and also as a hair-dye; *H. tricuspis*, Banks, introduced from the Society Islands; *H. mutabilis*, L., a handsome shrub or small tree, the flowers of which are remarkable for changing their colour during the day, those which are white in the morning turning to a bright red towards evening; *H. syriacus*, L.; and *H. schizopetalus*, Hook., a native of Trop. Africa, with pendulous orange-red flowers and deeply laciniate petals.

Calyx 5-cleft.

Bracteoles many, linear; calyx ventricose .	1. *H. Trionum.*
Bracteoles distinct, with a leaf-like appendage at the apex; calyx not ventricose .	2. *H. surattensis.*
Bracteoles distinct, without appendages; calyx not ventricose; seeds cottony.	
Corolla spreading	3. *H. hirtus.*
Corolla reflexed	4. *H. micranthus.*

Bracteoles minute or usually 0; seeds tuberculed, not cottony . . . . . 5. *H. Solandra.*

Bracteoles free or slightly connate below, without appendages; calyx not ventricose; seeds not cottony.

Bracteoles free from the calyx.

Flowers solitary and axillary or clustered at the ends of the branches.

Viscid, capsule not winged . . 6. *H. panduræformis.*

Villous, capsule 5-winged . . 7. *H. vitifolius.*

Flowers axillary, on short peduncles. A prickly herb . . . 8. *H. cannabinus.*

Flowers axillary, on long peduncles. A hispid or prickly undershrub . 9. *H. Gibsoni.*

Bracteoles adnate to the calyx . . 10. *H. Sabdariffa.*

Calyx spathaceous.

Bracteoles small, setaceous, caducous; flowers white with a pink centre. A prickly annual 11. *H. ficulneus.*

Bracteoles oblong-lanceolate, persistent; flowers yellow with purple centre. A bristly herb . . . . . 12. *H. pungens.*

Bracteoles linear or filiform; flowers yellow with crimson or purple centre.

Peduncles equalling the petioles . . . 13. *H. Abelmoschus.*

Peduncles shorter than the petioles.

Bracteoles 10-15, filiform, persistent . 14. *H. cancellatus.*

Bracteoles 8-10, linear-subulate, deciduous . . . . . 15. *H. esculentus.*

1. H. Trionum, *Linn. Sp. Pl. 697; F. B. I. i, 334.* H. vesicarius, *Cav. W. & A. Prod. 48; D. & G. Bomb. Fl. 19.*

A more or less pubescent annual. Lower *leaves* orbicular, undivided: upper 3-5-parted; lobes obovate-oblong, obtuse, toothed. *Bracteoles* numerous, linear. *Calyx* 5-cleft, ventricose, membranous, with green nerves, hispid. *Corolla* 1½ in. across, yellow with a purple spot at the base. *Capsule* oblong, obtuse. *Seeds* glabrous.

Dehra Dun, Moradabad, Gwalior, Merwara. DISTRIB.: W. Himalaya, from Kashmir to Simla; Sindh, Konkan, Bengal; also in S. Europe.

2. H. surattensis, *Linn. Sp. Pl. 696; Roxb. Fl. Ind. iii, 205; W. & A. Prod. 48; Royle Ill. 83; D. & G. Bomb. Fl. 20; F. B. I. i. 334; Watt E. D.*

An undershrub. *Stems* herbaceous, trailing, covered with soft hairs mixed with scattered prickles. *Leaves* long-petioled, roundish, deeply palmately 3-5-partite; lobes oblong, acute, serrate; petioles 2-3 in. longer than the blade, prickly. *Stipules* leafy, broad, semicordate,

auricled. *Peduncles* stiff, spreading, equalling the petioles, prickly. *Bracteoles* 10-12, linear, with a spathulate appendage. *Sepals* as long as the bracteoles, very acute at the apex. *Corolla* about 2 in. long, yellow with a dark centre. *Capsule* ovoid, acute, hairy; each carpel 3-awned. *Seeds* clothed with stiff yellowish hairs.

Near Delhi (Royle). Distrib.: Bengal to Penang and Ceylon; also in Trop. Asia, Africa and Australia.

3. **H. hirtus**, *Linn. Sp. Pl. 694; W. & A. Prod. 51; D. & G. Bomb. Fl. 20; F. B. I. i, 335.* H. phœniceus, *Willd. (excl. syn. Linn.); Roxb. Fl. Ind. iii, 202.*

Shrubby. *Leaves* about 3 in. long, ovate, acuminate, serrate, hairy, with a linear gland on the underside of the midrib; lower often cordate and 3-lobed; petiole 2 in., hairy; *stipules* ½ in., linear. *Peduncles* axillary, as long as or longer than the leaves, jointed below the flower, covered with spreading hairs. *Bracteoles* 5-7, shorter than the linear lanceolate sepals, subulate, hairy. *Corolla* ½ in. across, spreading, pink or white. *Capsule* globose, shorter than the calyx. *Seeds* cottony.

Moradabad, Etáwah, Saharanpur, Bundelkhand. Distrib.: Punjab, Konkan; also in Java Often cultivated

4. **H. micranthus**, *Linn. f. Suppl. 308, 310; W. & A. Prod. 51; D. & G. Bomb. Fl. 20; F. B. I. i, 335.* H. rigidus, *Roxb. Fl. Ind. iii, 195; Royle Ill. 83.*

A small shrub or perennial herb, with slender rod-like spreading branches, scabrid with stellate bristles. *Leaves* ½-1 in. long, ovate or oblong, acute, serrate or entire, without glands, petiole very short. *Peduncles* axillary, as long as or longer than the leaves, jointed near the top. *Bracteoles* 7-8, linear, shorter than the calyx. *Flowers* ¼-½ in. across, white or pink. *Calyx*-segments lanceolate. *Corolla* reflexed. *Capsule* globose, smooth. *Seeds* black, covered with cottony hairs.

Common in the drier parts of the area. Distrib.: Hotter parts of India to Ceylon; also in Trop. Africa and in Arabia. Roxburgh says that the green capsules are eaten by children. In Ceylon it is valued as a febrifuge.

5. **H. Solandra**, *L'Herit. Stirp. Nov. 103, t. 49; Roxb. Fl. Ind. iii, 197; F. B. I. i, 336.* H. pumilus, *Roxb. l.c. 203.* Lagunea lobata, *Willd.; W. & A. Prod. 55; D. & G. Bomb. Fl. 21.*

An erect annual, 1-2½ ft. high. *Stems* slightly branched, pubescent or somewhat hispid. Lower *leaves* long-petioled, ovate; upper more or less deeply 3-lobed; uppermost sometimes 3-foliolate: all cordate, acute, coarsely serrate, hairy on both sides; *stipules* setaceous. *Peduncles* 1-1½ in., 1-flowered, jointed near the top, arranged in a loose leafless terminal raceme. *Bracteoles* linear, minute or usually 0. *Flowers* ½-¾ in across, distant, yellow or pink. *Sepals* connate below, triangular, acute. *Petals* obliquely obcordate. *Capsule* ovoid, pointed, hairy at the top, not exceeding the calyx. *Seeds* blackish, tubercled

Not uncommon within the area. Distrib.: Westward to the Punjab, and eastward and south to Sikkim, Burma and Ceylon; also in E. Trop. Africa.

6. H. panduræformis, *Burm. f. Fl. Ind. 151, t. 47, f. 2; W. & A. Prod. 50; D. &. G. Bomb. Fl. 20; F. B. I. i, 338.* H. tubulosus, *Cav.; Roxb. Fl. Ind. iii, 196.*

A large annual or perennial viscid herb, without prickles. *Leaves* 1½-3 in., ovate, cordate, slightly 3-5-angled, serrate, tomentose on both surfaces; upper narrower; petiole about 2 in., shorter than the blade; *stipules* linear, divided, deciduous. *Peduncles* very short, axillary or clustered at the ends of the branches, jointed below the middle. *Bracteoles* 7-10, spathulate, erect, free from and shorter than the calyx. *Sepals* connate below, lanceolate, acute. *Corolla* tubular, yellow with a purple centre or wholly purple. *Filaments* few. *Capsule* ½ in. long, ovoid or globose, shorter than the calyx, densely covered with appressed bristly hairs. *Seeds* densely pubescent.

Bundelkhand. DISTRIB.: Hotter parts of India to Burma and Ceylon; also in Trop. Africa and Australia.

7. H. vitifolius, *Linn. Sp. Pl. 696; Roxb. Fl. Ind. iii, 200; W. & A. Prod. 50; D. & G. Bomb. Fl. 20; F. B. I. i, 338; Watt E. D.* H. truncatus, *Roxb. Fl. Ind. l. c.* Vern. *Ban-kapás.*

A tall much-branched perennial hispid herb, sparingly prickly. *Stems* 3-5 ft. high, slender, pubescent, or with a line of hairs down one side. *Leaves* generally small, 1-2 in. long, cordate, palmately 3-5-lobed; lobes oblong-lanceolate, acute, serrate, glabrous or tomentose on both surfaces; petiole 2½ in; *stipules* very small, setaceous. *Peduncles* axillary, solitary, or clustered at the ends of the branches, shorter than the petioles, jointed below the middle. Flowers drooping. *Bracteoles* 5-8, setaceous, distinct, free from and shorter than the calyx. *Sepals* connate half-way up, lanceolate, acute, pubescent. *Corolla* 2½ in. across, yellow with a purple centre, 2 or 3 times longer than the calyx. *Capsule* 5-winged, shorter than the enlarged spreading calyx, beaked, hairy. *Seeds* tuberculed.

Dehra Dún, Moradabad, N. Oudh, Bundelkhand, Gwalior, Merwára. DISTRIB.: Hotter parts of India from the Punjab to Ceylon; also in Trop. Africa and Australia. The bark yields a strong silvery fibre. Roxburgh's *H. truncatus,* according to the *Fl. Brit. Ind.,* is a variety smaller in all its parts.

8. H. cannabinus, *Linn. Syst., ed. X, 1149; Roxb. Fl. Ind. iii, 209; W. & A. Prod. 50; Royle Ill. 84; D. & G. Bomb. Fl. 20; F. B. I. i, 339; Field & Gard. Crops i, 86, t. XXII; Watt E.D.* Vern. *Patsan* (Deccan or Ambári Hemp).

An annual or perennial prickly herb, 2-3 ft. high. *Stems* glabrous. Lower *leaves* cordate; upper deeply palmately lobed; lobes narrow, serrate, mid-nerve glandular beneath; petioles prickly, the lower ones longer than the blade; *stipules* linear-subulate. *Peduncles* axillary, very short. *Bracteoles* 7-10, linear, shorter than the calyx. *Sepals* connate below the middle, bristly and with a gland at the back of each. *Corolla* large, spreading, yellow with a crimson centre. *Capsule* globose, pointed, bristly. *Seeds* almost glabrous.

Cultivated chiefly for its fibre during the hot weather and rainy seasons, especially in the districts of Meerut and of N. Oudh. It is

usually grown with other crops, or as a border to fields of *sugarcane*, *cotton* or *indigo*. It is more extensively cultivated in Central and S. India, and is reported to be wild on the eastern side of the Northern Ghâts. The fibre is soft, white and silky, and though not so valuable as that of *sanai* (*Crotalaria juncea*), it is largely used for making coarse sacking and ropes. In the Dacca District of Bengal it constitutes the chief material in the manufacture of paper. The young leaves are used as a potherb, and the oily seeds are eaten when roasted. Various parts of the plant are used medicinally.

9. H. Gibsoni, *Stocks ex Harv. & Sond. Fl. Cap. ii, 587; F. B. I. i, 339.*

An undershrub. *Branches* bristly or with minute prickles. *Leaves* 1-3 in., deeply palmately divided; lobes oblong-lanceolate, serrate, glabrous or hairy; petiole as long as the blade. *Peduncles* axillary, solitary, longer than the leaves. *Bracteoles* free, linear, prickly, curving over the calyx. *Sepals* lanceolate, connate below. *Corolla* twice the length of the bracteoles, yellow with a purple centre or wholly purple. *Capsule* ovoid, pointed; valves setose. *Seeds* pilose.

Merwára. DISTRIB.: Punjab, Sindh, Deccan, Konkan; also in Afghanistan, S. Trop. Africa and N. Australia.

10. H. Sabdariffa, *Linn. Sp. Pl. 695; W. & A. Prod. 52; Royle. Ill. 84; Field & Gard. Crops iii; 30; Watt E. D.* Vern. *Patwa, lal ambâri.* (Roselle, or Red Sorrel).

An erect glabrous annual, without prickles. *Stems* often reddish. Lower *leaves* undivided; upper palmately 3-5-lobed, glandular beneath; petiole 2 in. *Peduncles* axillary, solitary, very short, thickened at the summit. *Bracteoles* 8-12, adnate to the base of the calyx. *Calyx* accrescent; sepals connate below the middle into a deep red fleshy cup, bristly. *Corolla* 2½ in. across, yellow. *Capsule* ovoid, pointed, villous, shorter than the calyx. *Seeds* reniform, subglabrous.

This plant is cultivated in many gardens, chiefly for the sake of the edible fleshy calyx and capsule, from which an acid jelly is prepared. In Bengal, where the climate is more favourable, it is grown to a much larger extent. It is found also as a cultivated plant in most tropical countries. A strong silky fibre is obtained from the stems, and the fruit and seeds are used medicinally.

11. H. ficulneus, *Linn. Sp. Pl. 695; F. B. I. i, 340. Watt E. D.* H. prostratus, *Roxb. Fl. Ind. iii, 203.* H. strictus, *Roxb.; l.c. 206.* Abelmoschus ficulneus, *W. & A. Prod. 53.*

A large prickly annual, 6-14 ft. high. *Branches* usually prickly with small sharp tubercles. *Leaves* palmately 3-7-lobed, with wide sinuses; lobes obovate, narrowed to the base, unequally toothed. *Petiole* 2½-4 in., as long as the blade, often minutely prickly; *stipules* subulate, caducous. *Peduncles* ½ the length of the petioles; upper forming a leafless raceme. *Bracteoles* 5-6, small, setaceous, villous, quickly falling. *Calyx* spathaceous, the filiform ends forming a long tip to the buds. *Corolla* about 2 in. across, white with a pink centre. *Capsule* 1½ in. long, ovoid, 5-angled, tomentose, covered with viscid points when green. *Seeds* globose, slightly pilose.

Gwalior, Bundelkhand, Merwára. DISTRIB.: Punjab and Bengal to S. India and Ceylon. The stems yield a long glossy white strong fibre, useful for twine and light cordage. The seeds are often put into sweetmeats.

12. **H. pungens,** *Roxb. Hort. Beng. 50; Fl. Ind. iii, 213; F.B.I. i, 341.*

An erect bristly herb. *Branches* with scattered black dots. *Leaves* 5-8 in., roundish, cordate, palmately 7-lobed, lobes linear-lanceolate, acuminate, deeply serrate, upper 3-lobed; *petiole* longer than the blade; *stipules* broadly lanceolate, the upper ones linear. *Flowers* drooping. *Peduncles* 1-2 in. long, racemose. *Bracteoles* 4-5, oblong-lanceolate, acuminate, as long as the capsule, persistent, accrescent. *Corolla* 5 in. across, yellow with purple centre. *Capsule* ¾ in. long, slender, acuminate, longer than the calyx, hispid.

Dehra Dun, Bundelkhand. DISTRIB.: Trop. Himalaya from the Punjab to Sikkim, 2-5,000 ft.; also on the Khasia Hills, and in the Chanda dist., C. Prov. (Duthie). Flowers in the rainy season.

13. **H. Abelmoschus,** *Linn. Sp. Pl. 696; Roxb. Fl. Ind. iii, 202; F.B.I. i, 342; Watt E. D.* Abelmoschus moschatus, *Mœnch; W. & A. Prod. 53; Royle Ill. 84.* Vern. *Muskh-dána* (Musk Mallow).

A slightly branched hispid annual, 2-3 ft. high. *Leaves* ovate, cordate, or more usually palmately divided into 3-7 oblong-lanceolate acute or acuminate spreading lobes, coarsely toothed, hairy on both surfaces; *petiole* usually longer than the blade, with long deflexed hairs; *stipules* small, subulate. *Flowers* 3-4 in. across, bright yellow with a purple or crimson centre, solitary, often appearing to be terminal. *Peduncles* stout, equalling the petiole, curved, much thickened below the flower. *Bracteoles* 6-12, linear, distinct, hispid, much shorter than the calyx. *Sepals* completely connate save at their points, split down on one side. *Capsule* 2½-3 in. ovate, acute, hispid, longer than the bracteoles. *Seeds* reniform, musky.

Dehra Dun. DISTRIB.: Hotter parts of India from the base of the Himalaya. Cultivated in most tropical countries. Yields a strong fibre. The root, leaves, and the musk-scented seeds are used medicinally, and the leaves are sometimes employed in Upper India for clarifying sugar.

13. **H. cancellatus,** *Roxb. Hort. Beng. 51; Fl. Ind. iii, 201; F. B. I. i, 342.*

An erect bristly annual, 2-3 ft. high. *Leaves* 4-6 in. long, rounded or obtusely 5-angled, crenate, very hairy; upper sagittate; *stipules* linear, hairy. *Peduncles* much shorter than the petiole, racemose at the ends of the branches, each with 2 subulate bracts at the base. *Bracteoles* 10-18, about 1¼ in. long, linear, setaceous, incurved, hispid. *Flowers* 4-5 in. across, drooping, yellow with a purple or crimson centre. *Capsule* equalling the bracteoles, ovoid, furrowed, very hairy. *Seeds* many, reniform, black.

Dehra Dun, Bundelkhand. DISTRIB.: Along the base of the Himalaya from the Punjab to Nepal, ascending to 4,000 ft.; also in Chota Nagpur and in Pegu.

15. H. esculentus, *Linn. Sp. Pl. 696; F. B. I. i, 343; DC. L'Orig. Pl. Cult. 150; Field & Gard. Crops, iii, 29, t. lxxxvi; Watt E. D.* H. longifolius, *Roxb. Fl. Ind. iii, 210; Royle, Ill. 84.* Abelmoschus esculentus, *W. & A. Prod. 53.* Vern. *Bhindi, rámturai.* (Okro.)

A tall annual, covered with brittle hairs, not prickly. *Leaves* 8-12 in. long, 3-5-lobed, cordate; lobes lanceolate-oblong, coarsely toothed, scabrous; *petiole* about as long as the blade, often tinged with red; *stipules* subulate. *Peduncles* short and stout, shorter than the petioles. *Bracteoles* 8-10, linear-subulate, equalling the calyx, deciduous. *Flowers* large, yellow with a crimson centre. *Capsule* 6-10 in. long, pyramidal-oblong, acute, smooth or hairy. *Seeds* round, striate, smooth or hairy.

Cultivated all over India as a garden crop. The unripe mucilaginous capsules form a favourite vegetable for both natives and Europeans. They are also used as a pickle. The seeds alone are also eaten. The strong white silky fibre has been found very suitable for the manufacture of paper. The capsules and seeds are used medicinally. The plant is regarded as a native of Africa.

12. THESPESIA, Corr.; Fl. Brit. Ind. i. 345.

Trees or shrubs. *Leaves* lobed or not. *Inflorescence* axillary. *Bracteoles* 5, arising from the thickened end of the peduncle, deciduous. *Calyx* truncate, minutely 5-toothed or -parted. *Corolla* convolute. *Staminal*-tube 5-toothed at the apex. *Ovary* 4-5-celled; *styles* completely connate; *stigma* club-shaped; *ovules* few in each cell. *Capsule* loculicidal or scarcely dehiscent. *Seeds* glabrous or hairy.—About 8 species, all tropical.

T. populnea, Soland., a small tree, inhabiting the sea-coasts of India and other tropical countries, is occasionally found in gardens, and as a roadside tree within the area. From the shape of the flowers it is sometimes known by the name of the 'Tulip-tree.' For an account of its useful properties see Watt's Dictionary.

T. macrophylla. *Bl. Bijdr. 73;* T. Lampas, *Dalz. & Gibs. Bomb. Fl. 19; F. B. I. i, 345; Brand. For. Fl. 572; Watt E. D.* Hibiscus Lampas, *Cav.; Roxb. Fl. Ind. iii, 197; W. & A. Prod. 48; Royle Ill. 83.* H. tetralocularis, *Roxb. l. c. 199.* Vern. *Bankapási.*

A shrub or small tree. Herbaceous portions covered with brown stellate down. *Leaves* 3-5 in. in diam. more or less palmately lobed, cordate at the base, sparingly stellate-pilose above, densely stellate-tomentose beneath; midrib with a glandular pore at the base beneath; lobes 3, spreading, acuminate; *petiole* shorter than the blade; *stipules* subulate, caducous. *Peduncles* 3-flowered, axillary or terminal. *Bracteoles* 5, small, subulate, deciduous. *Calyx* connate below, with 5 distant teeth on the truncate margin. *Corolla* large, campanulate, convolute, yellow with a crimson centre. *Capsule* 1 in. long, ovate, pointed, 5-rarely 4-valved, valves hispid. *Seeds* glabrescent.

Common in sál forests from Dehra Dun eastward along the base of the hills. DISTRIB.: Himalaya up to 4,000 ft., Bengal and south to Ceylon; also in Burma, Java and E. Trop. Africa. The fibre is sometimes used for binding loads of wood.

13. GOSSYPIUM, Linn.; Fl. Brit. Ind. i. 343.

Herbs, shrubs or small trees. *Leaves* palmately lobed. *Peduncles* axillary, usually 1-flowered, jointed. *Flowers* large, yellow, with, or rarely without, a crimson centre, or wholly purplish. *Bracteoles* 3, large, leafy, cordate, sprinkled like the calyx with black glandular dots. *Calyx* truncate or slightly 5-toothed. *Petals* convolute or spreading. *Staminal-tube* as in *Hibiscus*. *Ovary* 3-5-celled; *style* clavate, 3-5-grooved; *stigmas* 3-5; *ovules* many in each cell. *Capsule* loculicidally 3-5-valved. *Seeds* densely clothed with woolly hairs.—Distributed over the warmer regions of the world.

The commercial importance of this genus demands clear and accurate definitions of all the cultivated kinds of cotton, whether these be regarded as species, varieties or hybrids. The chief difficulty met with in any attempt to assign to each its correct position by means of botanical diagnoses, is due, to a great extent, to the very ancient origin of some of the cottons as cultivated plants, and to their tendency to variation by hybridization. Further variability in regard to habit, structure and the quality of the wool is brought about under different conditions of climate, soil and cultivation

A great deal has been written on the subject of Indian cotton plants by the earlier Indian botanists, *e g.*, Roxburgh, Wight, Royle and others, but in a work of this kind it must suffice to refer the reader to their publications, and to draw attention rather to the more important results of recent investigations, and particularly to such as are most directly concerned with the cottons that are cultivated within the area of this flora.

Professor Partalore, in his beautifully illustrated work "Le Specie dei Cotone" (Florence 1866) recognized seven distinct species, *viz.*:—

G. arboreum, which includes Todaro's *G. neglectum*; G. herbaceum; G. sandvicense (= *G. tomentosum*, Nutt.); G. taitense; G. hirsutum; G. barbadense (= *G. maritimum*, Todaro); G. religiosum, (= *G. brasiliense*, Macf.).

In the Flora of British India the cottons of India are grouped under four species and five varieties, *viz.*:— G. Stocksii Mast.; G. herbaceum, Linn., including varieties *obtusifolium* Roxb. (sp.). *hirsutum* Linn. (sp.), *religiosum* Roxb. (sp.), and *vitifolium* Roxb. (sp.); G. barbadense, Linn., including var. *acuminatum* Roxb. (sp.); G. arboreum, Linn. *G. Stocksii* is a straggling shrub growing wild on the sea-coast of Sindh, and believed by Dr. Masters and other authors to be the primitive form

of *G. herbaceum*.* *G. herbaceum* is regarded by Dr. Masters as the source of the bulk of the cultivated cottons of India. *G. barbadense* includes the American series of cottons, and *G. arboreum* is the Tree-cotton, a native of Tropical Africa.

Professor Todaro of Palermo, after devoting many years to the study of cotton plants from all parts of the world, published his illustrated monograph of the genus (Rome and Palermo 1877-78). In this work he admitted no less than 54 species, reckoning as species such forms, the characters of which are preserved by cultivation. The results, however, of his researches have helped materially to unravel some difficult problems regarding the origin and development of numerous varieties and hybrids now existing in India. A few of the more important conclusions arrived at in regard to the cultivated cottons of India may be briefly summed up as follows:

(1) Typical *G. herbaceum* does not occur in India.

(2) Nearly all the commercial cottons of India are hybrids.

(3) From *G. Wightianum* have originated some of the most valuable kinds grown in Western and Southern India.

(4) *G. neglectum* constitutes the bulk of the cottons cultivated in the Eastern and Northern parts of India.

Dr. Watt, in his excellent article on *Gossypium*, included in Vol. IV of his Dictionary, has given a very complete account of the history and literature of Indian cotton plants; and in his classification he has adopted many of Todaro's conclusions regarding them.

The following is a brief account of the different kinds of cotton grown within the area of the Upper Gangetic Plain.

1. G. arboreum, *Linn. Sp. Pl. 693; Roxb. Fl. Ind. iii, 183; Royle Ill. 99, t. 23, f. 2; F. B. I. i, 347; Todaro Rel. Cult. Cot. 176, t. I. DC. L'Orig. Pl. Cult. 325; Watt E. D.* G. nigrum, *Buch.-Ham.; W. & A. Prod. 55.* G. religiosum, *D. & G. Bomb. Fl. Suppl. 8 (not of Roxb.).* Vern. *Narma, deo-kapás.*

Arborescent. *Leaves* 5-7-lobed, with an extra tooth in the left-side sinus (or on both sides) of the central lobe, subglabrous; lobes bristle-tipped. *Inflorescence* axillary, usually 1-flowered *Flowers* small, reddish-purple. *Bracteoles* with rounded ears at the base, toothed or subentire at the apex. *Ovary* rounded. *Seeds* with greyish-black velvet under the floss.

Found in gardens and near temples throughout India, hardly ever as a field-crop, unless in a state of hybridization.

2. G. neglectum, *Todaro Oss. Cot. 95 (sp.); Rel. Cult. Cot. 169 (sp.); Watt E. D.* G. herbaceum, (var. China cotton) *Roxb. Fl. Ind. iii, 185;*

* Dr. Watt, however, considers it as more likely to represent an acclimatized form of *G. barbadense*, or one of the numerous hybrids between that species and *G. herbaceum*, possessing the characteristic leaves of the latter and the deeply laciniate bracts, and naked seeds of the former. Todaro reduces it to *G. herbaceum* (proper).

Wight Ic. t. 11; Royle Ill. 93, t. 23, f. l. F. B. I. l, 346 (in part); Field & Gard. Crops I. 75,' t. XVIII (see footnote). Vern. *Kapás, bari, manua, radya.*

Sub-herbaceous. *Leaves* 3-5-7-lobed, extra tooth in sinus less distinct than in *G. arboreum;* lobes narrowly lanceolate, rarely bristle-tipped, densely clothed with long spreading hairs; and, if hybridized with *G. Wightianum*, with stellate hairs as well. *Inflorescence* on short lateral branches, 2-4-flowered. *Flowers* yellow with a purple centre, or yellow tinged with purple. *Bracteoles* large, with greatly elongated lateral ears, toothed at the apex. *Ovary* pointed. *Seeds* with green velvet below the floss.

Extensively grown as a field-crop in the Upper Gangetic Plain, also in Bengal and in the Punjab. Whether treated as a species, variety or hybrid, it is necessary to assign to this plant a sufficiently prominent position in this flora by reason of its economic importance, although under other circumstances it might not be necessary to regard it as more than constituting a series of hybrids connecting *G arboreum* with some form of *G. herbaceum*. The cotton yielded by this plant is classed commercially under the name of "*Bengals.*"

3. G. herbaceum, *Linn. Sp. Pl. 693; Roxb. Fl. Ind. iii, 184 (in part); F. B. I. i, 346 (in part); Todaro Rel. Cult. Cot. 131, t. IV. fig. a. b. c.; DC. L'Orig. Pl. Cult. 323.*

The typical form of this species is, according to Todaro, a native of Asia, and perhaps also of Egypt, but does not extend to India. Specimens have, however, been gathered from cultivated plants at Gilgit and elsewhere within the North-West frontier. It differs from the ordinary Indian cottons by its broader leaves and with the lobes more rounded, the absence of felted hairs, and by the more acute and shortly toothed bracteoles.

4. G. Wightianum, *Todaro Oss. Sp. Cot. 47; Rel. Cult. Cot 141, t. IV, figs. 1-9; Watt E. D.* G. herbaceum, *Wight Ic. t. 9; F. B. I. i, 316 (in part).* G. album, *W. & A. Prod. 54.*

Stems erect, somewhat hairy. *Leaves* when young densely matted with short stellate hairs, which fall off in patches, leaving a few scattered all over both surfaces, ovate-rotund, almost obsoletely cordate, 3-5 rarely 7-lobed; lobes ovate-oblong, acute, constricted at the base into the rounded sinus which in the young leaves rises up as a fold; *stipules* on the pedunoles almost ovate, the others linear-lanceolate, acuminate. *Flowers* yellow with a deep purple patch at the base, becoming reddish on the outside on passing maturity. *Bracteoles* small, ovate, cordate, acute, shortly toothed. *Seeds* with very short firmly-adhering velvet; wool white or tinged with red.

This plant, which Professor Todaro alludes to as the species of the greatest importance to India, is grown to some extent within the Upper Gangetic area along with *G. neglectum*, between which and *G. arboreum* it has formed numerous hybrids. In its purer forms it is found more abundantly in the western portion of India, from the Punjab and Rajputana southward to Bombay. *G. Wightianum* possesses considerable

interest also in pointing to the probability of its representing the nearest approach to what may be considered an indigenous species of India. It has been found growing apparently quite wild as a climber in the forests west of Bár in Merwára, also in the Ajmir District, as well as in Rajputana and the Punjab.

The attempts made to acclimatize various kinds of American cotton in India have hitherto resulted in failure. Stray specimens may occasionally be observed in fields sown with the ordinary Indian varieties, but the influence of hybridization has invariably produced degeneration.

14. KYDIA, Roxb.; Fl. Brit. Ind. i. 348.

Trees with stellate pubescence. *Leaves* palminerved, usually lobed. *Flowers* panicled, polygamous. *Bracteoles* 4-6, leafy, connate at the base, accrescent and spreading in fruit. *Sepals* 5, connate below the middle. *Petals* 5, obcordate, oblique, longer than the calyx, adnate to the tube of the stamens. *Staminal*-tube divided about the middle into 5 divisions, each bearing 3 reniform anthers which are imperfect in the fem. flowers. *Ovary* 2-3-celled; *style* 3-cleft; *stigmas* 3, peltate, imperfect in the male flower; *ovules* 2 in each cell, ascending. *Capsule* subglobose, muticous, locuiicidally 3-valved. *Seeds* 3, reniform, furrowed.—*Species* 2, both found in India.

K. calycina, *Roxb. Hort Beng. 50; Fl. Ind. iii, 118; W. & A. Prod. 70; F. B. I. i, 348; Brand. For. Fl. 29; Watt E. D.* K. fraterna, *Roxb. l. c. 189.* Vern. *Pula, puli, pulu, pattra and palás* (Bijnor).

A small tree, young parts stellately tomentose. *Leaves* 4-6 in. long, rounded, cordate, palmately 7-nerved, more or less lobed, glabrous above or with thinly scattered hairs, tomentose beneath; petioles 2-3-in. *Inflorescence* much branched, many-flowered. *Bracteoles* oblong-spathulate, nearly as long as the calyx, ultimately spreading, downy. *Flowers* white or pink, in axillary or terminal panicles. *Sepals* ovate, acute. *Staminal*-tube shorter than the petals. The size and proportion of the parts of the flower vary according to sex.

Forests of Dehra Dun and Saharanpur, and along the base of the Himalaya from the Jumna eastwards. DISTRIB.: Punjab, W. Ghats, Burma. Leafless from February to April. Flowers July to October. The fibre of the inner bark is used for coarse ropes. the leaves are medicinal, and the mucilaginous bark is employed for clarifying sugar.

15. BOMBAX, *Linn.*; *Fl. Brit. Ind. i. 349.*

Trees. *Leaves* digitate, deciduous. *Peduncles* axillary or subterminal, solitary or clustered, 1-flowered. *Flowers* appearing before the leaves. *Bracteoles O. Calyx* leathery, cup-shaped, truncate or

5-7-lobed. *Petals* obovate. *Stamens* in 5 bundles opposite the petals, divided above into numerous filaments; *anthers* reniform, 1-celled. *Ovary* 5-celled; *style* clavate; *stigmas* 5; *ovules* many in each cell. *Capsule* loculicidally 5-valved; valves leathery, woolly within. *Seeds* woolly, albumen scanty. Species about 40, mostly tropical American.

B. malabaricum, *DC. Prod. i. 479; W. & A. Prod. 61; Royle Ill. 101; Brand. For. Fl. 31; F. B. I. i, 349; Watt E. D. B. heptaphyllum, Cav.; Roxb; Fl. Ind. ii, 167*; Salmalia malabarica, *Schott. and Endl.*; *D. & G. Bomb. Fl. 22.* Vern. *Semal.* (Silk Cotton-tree.)

A large handsome deciduous soft-wooded tree with a straight buttressed trunk, and wide-spreading branches in whorls. Young stem and branches covered with hard conical prickles. *Leaves* large, spreading, glabrous; *leaflets* 5-7, lanceolate acuminate, tapering below, 6-12-in. long, quite entire; *petiole* longer than the leaflets; secondary petioles 1 in.; *stipules* small, caducous. *Flowers* large, numerous, crimson or yellowish, on short thick pedicels, clustered towards the ends of the branches. *Calyx* cup-shaped, smooth outside, silky within; margin slightly lobed, deciduous with the corolla and stamens. *Petals* 5, oblong, recurved above, fleshy, twice as long as the stamens. *Stamens* many, filaments pink, anthers brown. *Ovary* conical, glabrous; *style* longer than the stamens. *Capsule* 4-5 in. long, oblong, downy, green; valves silky within. *Seeds* many, obovate smooth, enveloped in dense silky hairs.

Common in forests, especially along the base of the Himalaya. DISTRIB.: Outer Himalaya, up to 3,000 ft., and throughout the hotter parts of India to Burma and Ceylon: also in Java and Sumatra. A rapid-growing tree, attaining under favourable conditions a height of 150 ft., with a girth of 40 ft.; the tree is leafless between Nov. and April; flowers during Feb. and March, and the fruit ripens in April and May. The wood is durable under water; the silk surrounding the seeds is much used for stuffing pillows; the gum (*mochras*) and root (*musla*) are medicinal, and the calyx of the flower-buds is eaten as a vegetable. For particulars regarding these and other useful products see Watt's Dictionary.

XXII.—STERCULIACEÆ.

HERBS, shrubs, or trees; herbaceous portions more or less stellate-pubescent. *Bark* usually abounding in mucilage, inner fibrous. *Leaves* alternate, stipulate, simple lobed or digitate. *Inflorescence* axillary or terminal, usually cymose. *Flowers* regular (except in *Helicteres*) 1- or 2-sexual. *Sepals* 5, more or less connate. *Petals* 5 or 0. *Stamens* usually many, or arranged along the edges of a cup or tube with intervening staminodes. *Anther*-cells 2, parallel or divergent. *Ovary* free, 2-5-celled, rarely of one carpel (*Waltheria*), sessile or stalked; *styles* consolidated, or as many as the cells of the ovary;

ovules many or few, attached to the inner angles of the carpels. *Fruit* dry or fleshy, dehiscent or indehiscent. *Seeds* sometimes arillate, with or without albumen.—Natives of the tropics of both hemispheres.

From the seeds of *Theobroma Cacao*, L., a tropical American tree, the various preparation of cocoa and chocolate are manufactured. *Cola* nuts, the produce of *Cola acuminata*, R., Br., a large tree inhabiting Tropical Africa, are used for the same purpose.

Flowers polygamous, petals 0. . . .	1. STERCULIA.
Flowers all 2-sexual, petals 5.	
Petals deciduous, anthers in groups at the summit of the staminal-column and alternating with staminodes.	
Ripe carpels of spirally twisted follicles, seeds without wings	2. HELICTERES.
Fruit a woody capsule, seeds winged .	3. PTEROSPERMUM.
Petals deciduous, stam-tube antheriferous throughout, staminodes 0. . . .	4. ERIOLÆNA.
Petals persistent, stam-tube short; anthers in groups, alternating with staminodes.	
Bracteoles caducous; fertile stamens 15, in 5 groups (of 3 each), alternating with 5 petaloid staminodes	5. PENTAPETES.
Bracteoles persistent; fertile stamens 5, alternating with 5 ligulate staminodes .	MELHANIA.
Petals persistent, stam-tube short, stamens 5, staminodes 0.	
Ovary 5-celled	7. MELOCHIA.
Ovary of 1 carpel	8. WALTHERIA.
Petals deciduous, with a concave dilated claw; fertile stamens in groups of 3 at the base of 5 petaloid staminodes . .	9. ABROMA.

1. STERCULIA, Linn.; Fl. Brit. Ind. i. 354.

Trees or shrubs. *Leaves* simple, palmately lobed or digitate. *Flowers* in panicles, polygamous. *Calyx* tubular, 4-5-parted, often brightly coloured. *Petals* 0. *Staminal*-column bearing a head or ring of sessile anthers. *Carpels* 1-7, sessile or on a gynophore, follicular, woody or membranous when ripe. *Seeds* one or

more in each carpel, often winged, sometimes arillate.—Tropics of both hemispheres, abundant in tropical Asia.

Follicles woody, opening when ripe.

Panicles erect, follicles bristly . . . 1. *S. urens.*

Panicles drooping, follicles downy . . 2. *S. villosa.*

Follicles membranous, opening before maturity.

Leaves glabrous ; flowers orange-scarlet . 3. *S. colorata.*

Leaves tomentose beneath ; flowers yellow 4. *S. pallens.*

1. S. urens, *Roxb. Fl. Corom. i, 25, t. 24 ; Fl. Ind. iii, 145 ; W. & A. Prod. 63 ; Royle Ill. 102 ; D. & G. Bomb. Fl. 23 ; F. B. I. i, 355 ; Brand. For. Fl. 33 ; Watt E. D.* Vern. *Kuli, kulu, kor* (Merwára).

A moderate-sized soft-wooded tree, 30-50 ft. high. Outer bark peeling off like paper, whitish tinged with pink. *Leaves* 8-12 in. long, crowded at the ends of the branches, palmately 5-lobed, glabrous above, tomentose beneath, cordate ; lobes entire, caudate-acuminate ; *petioles* 6-9-in., tomentose ; *stipules* caducous. *Panicles* erect, terminal, many-flowered, gland-pubescent. *Bracts* lanceolate, deciduous. *Flowers* less than ½ in. across, greenish-yellow, mostly male. *Calyx* campanulate, 5-parted ; lobes acute, spreading, glandular inside at the base, pubescent on both sides. *Stamens* 15-20, united into a short column. *Follicles* 5, spreading, woody, densely pubescent and armed with stiff stinging bristles, red when ripe. *Seeds* oblong, dark brown.

Tarai and Siwalik tracts westward to the Jumna ; also in Bundelkhand and Gwalior, mostly on dry rocky hills associated with *Boswellia*. DISTRIB. : Bengal, and W. and S. India to Ceylon. The tree is leafless during the winter, flowers from January to March. The inner bark yields a strong fibre ; a white gum (*katira*) exudes from the bark, and the seeds are sometimes eaten roasted.

2. S. villosa. *Roxb. Hort. Beng. 50 ; Fl. Ind. iii, 153 ; W. & A. Prod. 63 ; Royle Ill. 102 ; D. & G. Bomb. Fl. 22 ; F. B. I. i. 355 ; Brand. For. Fl. 32, t. X. ; Watt E. D.* Vern. *Godgudála, udár* (Oudh).

A small or medium-sized tree, upwards of 50 ft. high. *Bark* pale grey or brown. Young portions tawny-tomentose *Branches* marked with large scars. *Leaves* 12-18 in. in length and breadth, crowded at the ends of the branches, cordate, nearly glabrous above, tomentose beneath, deeply palmately 5-7-lobed : lobes oblong or ovate-oblong, abruptly acuminate and often cleft at the apex ; *petiole* about as long as the blade ; *stipules* broadly lanceolate, acuminate, deciduous. *Panicles* 6-12 in. long, from the axils of the previous year's leaves, drooping ; branches many-flowered, tomentose. *Bracts* linear, caducous. *Flowers* yellow, mostly male, on slender pedicels. *Calyx* campanulate, with 5 ovate acute spreading lobes, yellow, and tinged with purple or pink at the base, stellate-hairy outside, glabrous inside. *Staminal*-column bearing 10 nearly sessile anthers. *Ovary* globose. *Follicles* 2-7, sessile, spreading, 1½-3

in. long, tapering at both ends, bright red when ripe, coriaceous, rough with stellate pubescence outside, smooth and shining inside. *Seeds* oval, smooth.

Forests of Dehra Dun and of the Siwalik range, Rohilkhand, and Oudh. DISTRIB.: Outer Himalaya from Kumaon westward to the Indus, up to 3,500 ft.; Salt range (Punjab); Bengal, W. & S. India, and in the Andaman Islands. The flowers appear before the new leaves in March and April, and the fruit ripens in June and July. The wood is soft and light. From the bark a very strong fibre is obtained, as well as a gum similar to that of the preceding species, and also called "*katira*."

3. **S. colorata.** *Roxb. Fl. Corom. i, 26, t. 25; Fl. Ind. iii, 146; W. & A. Prod. 63; D. & G. Bomb. Fl. 23; F.B. I. i, 359; Brand. For. Fl. 34; Watt E. D.* Vern. *Bodula, samarri* (Oudh), *karar* (Bundelkhand).

A moderate-sized tree, often with a fluted trunk. *Leaves* crowded at the ends of the branches, 6-9 in. long, usually 5-lobed, roundish or reniform, deeply cordate, thinly coriaceous, pubescent when young, ultimately glabrous; lobes triangular, acuminate, entire; *petiole* 4-9 in., puberulous; *stipules* lanceolate, caducous. *Flowers* many, in erect panicles from the axils of the previous year's leaves, densely clothed as also the short pedicels with coral-red stellate tomentum. *Calyx* ¾ in. long, funnel-shaped, curved; lobes short, triangular, acute, pilose within. *Anthers* 20-30, sessile, closely surrounding the 5 flask-shaped ovaries. *Styles* 5; *stigmas* acute. *Follicles* 2-3 in. long, stalked, membranous, glabrous, opening long before maturity. *Seeds* usually 2, oval, smooth, pinkish outside.

Forests of Rohilkhand and Oudh (rare); also in Bundelkhand. DISTRIB.: Himalaya up to 4,000 ft., and southward from Bengal to South India and Ceylon; also in Burma and the Andamans. *Flowers* during March and April shortly before the new leaves appear. Wood very soft. The twigs and leaves are used as cattle fodder.

4. **S. pallens.** *Wall, in Voigt Hort. Suburb. Calc. 105 (name only); King in Journ. As. Soc. Beng. LX, pt. ii, 73; Fl. Malay Pen. 182.* S. fulgens, *F. B. I. i, 360 (in part).* Vern. *Kardala* (Dehra Dun).

A small tree with yellowish smooth bark. *Leaves* crowded at the ends of the branches, upwards of 12 in. in diam., obscurely 3-lobed, orbicular or subsquarrose, cordate, coriaceous, scabrid above, densely clothed beneath with yellowish stellate tomentum even when mature; lobes acute or acuminate; *petioles* about as long as the leaves, terete, downy. *Flowers* in erect panicles, appearing before the leaves, densely clothed with pale yellow stellate down. *Calyx* about ¾ in. long, campanulate, smooth inside; teeth about ⅓ the length of the tube, ovate, acuminate. *Follicles* 3-4 in. long, stalked, membranous, prominently veined, smooth and shining when mature. *Seeds* 2, about ¼ in. long, oval, smooth.

Dehra Dun and Siwalik range. DISTRIB.: Himalaya up to 5,000 ft. in Garhwal and Kumaon. Flowers in March and April. This species may be distinguished from *S. colorata* chiefly by the tomentose under surface of the leaves, and by the shape and colour of the calyx. The seeds are eaten.

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2. HELICTERES, Linn.; Fl. Brit. Ind. i, 365.

Trees or shrubs. *Leaves* simple. *Flowers* axillary, solitary or fascicled. *Calyx* tubular, 5-fid., often irregular. *Petals* 5, clawed, equal or unequal, the claws often with ear-shaped appendages. *Staminal*-column adnate to the gynophore, 5-toothed at the apex. *Anthers* in groups at the top of the column between its teeth. *Ovary* at the top of the column, 5-lobed, 5-celled; *styles* subulate, more or less united, stigmatose at the tips; *ovules* many in each cell. *Follicles* spirally twisted or straight. *Seeds* tubercled; albumen scanty.—Species about 40, found in the tropics of both hemispheres.

H. Isora, *Linn. Sp. Pl. 963; Roxb. Fl. Ind. iii, 143; W. & A. Prod. 60; Royle Ill. 101; D. & G. Bomb. Fl. 22; F. B. I. i, 365; Brand. For. Fl. 34; Watt E. D.* Vern. *Marorphal, bhendu, kapási* (Saharanpur).

A shrub or small tree. Young branches rough with scattered stellate hairs. *Leaves* bifarious, upwards of 5 in. long, palmately nerved, obovate or suborbicular, often 3-lobed, obliquely cordate, shortly acuminate, irregularly serrate, rough above, pubescent beneath; petiole ¼ in.; *stipules* as long as the petioles, subulate, deciduous. *Flowers* solitary, or in few-flowered minutely bracteolate cymes. *Calyx* ½ in., narrowly campanulate, curved, laterally compressed, gibbous, hairy outside; teeth triangular, acute, unequal. *Petals* red turning to lead colour, reflexed, the 2 lower shorter and broader than the 3 upper ones, long-clawed, more or less connate below, obtuse; claws winged. *Staminal*-column fused with the gynophore, exserted and reflexed above. *Anthers* 10, surrounding the ovary and alternating in pairs with 5 minute scales (staminodes) within the staminal-tube. *Styles* united, as long as the ovary, deflexed. *Fruit* about 2 in. long, cylindrical, composed of 5 spirally twisted tomentose follicles on a long gynophore. *Seeds* numerous.

Forests of Dehra Dun and Siwaliks, and eastward along the base of the Himalaya; common in Oudh, also in Bundelkhand and Merwára. DISTRIB.: From the Punjab and Bengal to S. India and Ceylon; also Malay Pen., Java and Australia. The hazel-like foliage is renewed in April; the flowers open during the hot and rainy seasons, and the fruit ripens in the cold season. A strong fibre, resembling that of *jute*, is obtained from the bark; and the twisted fruit is much used medicinally for intestinal disorders, on the theory of signatures.

3. PTEROSPERMUM, Schreb.; Fl. Brit. Ind. i, 366.

Trees or shrubs, young parts scaly or stellate-tomentose. *Leaves* usually bifarious, simple or lobed, penninerved, unequal-sided, leathery. *Peduncles* 1-3, usually axillary. *Bracteoles* entire or laciniate, persistent or caducous. *Calyx* of 5 more or less connate sepals. *Petals* 5, deciduous with the calyx. *Staminal*-column

short. *Anthers* in triplets, opposite the sepals and alternating with 5 ligulate staminodes. *Ovary* inserted within the top of the staminal coulmn, 3-5-celled; *style* entire; *stigma* 5-furrowed; *ovules* many in each cell. *Capsule* woody or coriaceous, terete or angled, loculicidally 5-valved. *Seeds* winged above, attached in 2 rows to the inner angle of the cells; albumen thin or 0.—Species about 18, inhabiting tropical Asia.

1. P. acerifolium, *Willd Sp. Pl. iii. 729; Roxb. Fl. Ind. iii. 153; W. & A Prod. 69; F. B. I. i, 367 (excl. P. aceroides, Wall.); Brand. For. Fl. 35, t. XI; Watt E. D.* Vern. *Kanak-champa.*

A medium-sized tree with smooth ash-coloured bark. Young branches and calyx covered with thick ferruginous tomentum. *Leaves* large, peltate or obovate-oblong, sinuately lobed, glabrous above, grey-tomentose beneath; *stipules* many-cleft, caducous. *Flowers* axillary, on short pedicels, with many-cleft *bracts*, pure white, fragrant. *Calyx* deeply 5-cleft; segments linear, up to 5 in. long. *Petals* linear or obliquely cuneate, revolute. *Capsule* 2-6 in. long, woody, 5-angled, brown-tomentose. *Seeds* many, obliquely oval, compressed, with large thin membraneous wings.

In duns between the Jumna and the Sarda rivers, often growing in swamps. DISTRIB.: Wild or cultivated over the greater part of India. Flowers March to June; fruit ripens during the cold season. The leaves are used as plates, and for packing tobacco and other articles.

2. P. lanceæfolium, *Roxb. Hort. Beng. 50; Fl. Ind. iii, 163; F.B.I. i. 368; Brand. For Fl. 35.*

A large tree. Young portions and underside of leaves with short white tawny tomentum. *Leaves* 3-6 in. long, very shortly stalked, lanceolate, acuminate, 1-nerved, glabrous above, entire; base rounded; nerves stellate-hairy; *stipules* 2-3 fid., subulate, as long as the petiole. *Flowers* 2-3 in. across, axillary, on peduncles longer than the calyx, with 2-3 linear laciniate bracts, white, fragrant. *Sepals* 1 in. long, linear, revolute, rusty-pubescent outside, villous inside. *Petals* obliquely cuneate, longer than the sepals. *Capsules* about 3 in. long, obscurely 5-angled, 5-celled, ovoid, acute, hoary. *Seeds* 2-4 in each cell, winged.

Sub-Himalayan tract westward to the Jumna, but doubtfully wild within the area of this flora. DISTRIB.: Sylhet, Khasia Hills, Burma. Flowers in May and June. Often cultivated in gardens.

4. ERIOLÆNA, DC.; Fl. Brit. Ind. i, 370.

Trees or shrubs. *Leaves* simple or lobed, downy or stellate-tomentose beneath. *Peduncles* axillary, 1-many-flowered. *Bracteoles* 3-5, laciniate, or small and caducous. *Calyx* at first spathaceous ultimately 5-parted. *Petals* flat, with dilated tomentose claws, deciduous. *Staminal*-column short, bearing externally numerous linear oblong parallel-celled anthers in many series. *Staminodes* 0.

Ovary sessile 5-10-celled; *style* erect; *stigmas* 5-10, spreading; *ovules* many in each cell *Capsule* woody, loculicidal. *Seeds* winged above; albumen thin.—Species 7 or 8, all Asiatic.

Peduncles 1-flowered.	1. *E. Wallichii.*
Peduncles many-flowered.	
Style pubescent	2. *E. Hookeriana.*
Style glabrous	3. *E. Candollei.*

1. E. Wallichii, *DC. Mém. Mus. Par. X, 102; F. B. I. i, 370. Watt E. D*

A shrub or small tree; herbaceous portions shaggy-tomentose. *Leaves* 4-8 in., ovate or roundish, acuminate, 7-nerved, base cordate, crenate-serrate, pilose above, stellate-tomentose beneath; *petiole* 1-2 in.; *stipules* about 1 in. long, leafy, lanceolate, with acute lobes. *Peduncles* 1-flowered, villous, shorter than the leaves. *Bracteoles* pinnatisect. *Flowers* 2½ in. across. *Sepals* lanceolate, floccose-tomentose outside, villous within. *Petals* orbicular, with a narrow hairy claw. *Staminal*-column glabrous. *Style* pilose. *Fruit* not seen.

In the Gonda district of Oudh, adjoining the Nepal frontier (Duthie's collectors). This is probably the plant referred to by Brandis in his For. Fl. p. 36 as having been found in Oudh by Mr. Richard Thompson. DISTRIB.: Nepal and Sikkim Himalaya. The wood is much esteemed by the Nepalese.

2. E. Hookeriana, *W. & A. Prod. 70; F. B. I. i, 370; Brandis For. Fl. 36.*

A small tree; herbaceous portions stellate-downy. *Leaves* 4 in. each way, roundish, acuminate, serrate, cordate, thinly stellate-hairy or glabrescent above, rusty-tomentose beneath; nerves prominent beneath; *petiole* 2-in. *Peduncles* many-flowered, longer than the petiole. *Bracteoles* shorter than the calyx, much cut, pubescent. *Flowers* 2-in. across. *Sepals* narrowly lanceolate. *Styles* pubescent. *Capsule* 1 in., ovoid, pointed, 10-valved; valves downy tuberoled or pitted, villous at the inner angle.

Dry hills in Bundelkhand, also near Gwalior and Guna. DISTRIB.: Behar, Konkan and southward to the Nilgiri and Pulney Mts.; also in Bhutan and Burma.

3. E. Candollei, *Wall. Pl. As. Rar. i, 51, t. 64; D. & G. Bomb. Fl. 24; F. B. I. i, 370; Brand. For. Fl. 36. Watt E. D.* Vern. *Bim.* (Gorakhpur.)

A deciduous tree with grey bark: herbaceous portions stellate-hairy. *Leaves* up to 5 in. long, palmately 5-7-nerved, ovate, acuminate, cordate, crenate-dentate, stellate-hairy above, grey-pubescent beneath; lobes rounded; *petiole* 1½-3-in. *Peduncles* many-flowered, shorter than the leaves. *Bracteoles* pinnatifid, pubescent. *Flowers* 1½ in. across, yellow. *Sepals* lanceolate, glandular within at the base, a little longer than the bracteoles. *Petals* oblong, with a thick hairy claw. *Style* glabrous; *stigmas* 8-10, revolute. *Capsules* about 2-in. long, ovoid, acute, beaked, 10-lobed. *Seeds* many.

By the Choti Gandak in the Gorakhpur District (Brandis). DISTRIB.: Konkan, Burma. The handsome wood is valued for gunstocks, etc.

5. PENTAPETES, Linn.; Fl. Brit. Ind. i, 371.

Annual. *Leaves* hastate-lanceolate. *Flowers* axillary. *Bracteoles* 3, subulate, caducous. *Sepals* 5, lanceolate, connate below. *Petals* 5. *Stamens* 20, connate at the base; fertile 15, in groups of 3 alternating with 5 linear obtuse staminodes, which are nearly as long as the petals. *Ovary* sessile, 5-celled, many-ovuled; *style* entire, clavate and spirally twisted; *stigmas* 5, minute. *Capsule* loculicidally 5-valved. *Seeds* 8-12, 2-seriate in each cell, not winged.—A single species, widely distributed in tropical Asia.

P. phœnicea. *Linn. Sp. Pl 698; Roxb. Fl. Ind. iii, 157; W. & A. Prod. 67; F. B. I. i, 371; Watt E. D.* Vern. *Dopahariya.*

Stems branched, 2-5 ft. *Leaves* variable, up to 5 in. long, deltoid or hastate to linear, strongly crenate-serrate, glabrous above, stellate-hairy on the veins beneath; *petiole* 1 in.; *stipules* linear, equalling the petiole. *Peduncles* shorter than the leaves, 1-2 flowered, jointed near the top. *Bracteoles* 3-5, filiform, ½ as long as the calyx, caducous. *Sepals* lanceolate, acute, scabrous. *Petals* obovate. *Capsule* subglobose, ½ in., shorter than the persistent sepals, bristly with stellate hairs. *Seeds* angular, rough.

In rice fields and marshy places. DISTRIB.: Throughout the hotter parts of India from the Punjab and Bengal to S. India; also in Burma. The capsules and root are used medicinally. The flowers open at noon and close again early on the following morning.

6. MELHANIA, Forsk.; Fl. Brit. Ind. i, 372.

Shrubs. *Leaves* simple, downy. *Peduncles* 1-4 flowered. *Bracteoles* 3-5, cordate. *Flowers* yellow. *Sepals* 5, connate below. *Petals* 5, marcescent. *Stamens* 10, connate below into a very short tube; the fertile ones 5, alternating with as many ligulate staminodes; anther-cells parallel. *Ovary* sessile, 5-celled; cells 1-many-ovuled; *styles* 5, connate below, stigmatiferous on their inner faces. *Capsule* loculicidally 5-valved. *Seeds* albuminous.—Species about 20, distributed over the hotter parts of Asia, Africa and Australia.

Leaves roundish or broadly ovate; bracteoles longer than the calyx	1. *M. Hamiltoniana.*
Leaves oblong acuminate; bracteoles equall the calyx	2. *M. futteyporensis.*
Leaves oblong-lanceolate; bracteoles shorter than the calyx	3. *M. tomentosa.*

1. M. Hamiltoniana, *Wall. Pl. As. Rar. i, 69; F. B. I. i, 372.*

A cano-tomentose shrub with spreading branches. *Leaves* 2-3 in. long, roundish-ovate, subcordate, obtuse, unequally toothed, pubescent on both surfaces, white beneath; *petiole* 1 in; *stipules* setaceous, about as long as the petioles. *Peduncles* axillary and terminal, 1-3-flowered, twice as long as the petioles. *Bracteoles* cordate-ovate, longer than the calyx, recurved at the edges *Sepals* lanceolate, cuspidate, villous. *Petals* obovate, oblique, longer than the sepals. *Capsule* ovoid, shorter than the calyx, villous. *Seeds* many in each cell, oblong.

Merwára. DISTRIB.: Rájputána, Western Peninsula, Burma.

VAR. abutiloides. *Arn. (sp.)*; leaves deeply cordate, acute or acuminate, membranous, petals much exceeding the calyx.—Bundelkhand (Edgeworth), Gwalior district (Maries.) DISTRIB.: Punjab and W. Peninsula.

2. M. futteyporensis, *Munro ex Mast. in F. B. I. i, 373.* M. Hamiltoniana, *Munro Hort. Agrens. 9 (not of Wall).*

A coarse pubescent shrub. *Leaves* 3 in. long, oblong, cordate, acuminate, serrate; *petiole* 1 in.; *stipules* setaceous. *Peduncles* axillary and terminal, 2-4-flowered, twice the length of the petiole. *Bracteoles* equalling the calyx, cordate-oblong, acute, margins recurved. *Flowers* 1 in. across. *Sepals* lanceolate, cuspidate. *Capsule* ½ in., oblong, villous, a little shorter than the sepals.

Fattehpur-Sikri near Agra (Munro), Delhi (Falconer), Bundelkhand (Edgeworth), Merwára. DISTRIB.: Sindh, Punjab.

3. M. tomentosa, *Stocks ex Mast. in F. B. I. i, 373.*

A cano-tomentose shrub. *Leaves* about 2 in. long, oblong-lanceolate, cordate, crenate-serrate, thinly stellate-hairy above, paler and softly pubescent beneath; *petiole* ¾ in. *Peduncles* 2-3-flowered, in terminal cymes, about equalling the leaves. *Bracteoles* ½ in., oblong-lanceolate, cuspidate, shorter than the sepals, margins not recurved. *Sepals* ¾ in., oblong, cuspidate, tomentose. *Capsule* oblong, villous, shorter than the calyx. *Seeds* muricate, angled.

Delhi (Falconer). DISTRIB.: Punjab, Sindh, Nimar dist. C. Prov. Nearly allied to *M. futteyporensis*, but with much smaller flowers.

7. MELOCHIA, Linn.; Fl. Brit. Ind. i, 373.

Herbs or undershrubs, more or less downy. *Leaves* simple. *Flowers* small, clustered or loosely panicled. *Sepals* 5, connate below. *Petals* 5, spathulate, marcescent. *Stamens* 5, opposite to the petals, connate below into a tube; anther-lobes parallel, extrorse. *Staminodes* 0. *Ovary* sessile, 5-celled; cells opposite the petals, 2-ovuled; *styles* 5 free or connate at the base. *Capsule* loculicidally 5-valved. *Seeds* ascending, albuminous.—Species about 60, found in the warmer regions of both hemispheres.

M. corchorifolia, *Linn. Sp. Pl. 675; Roxb. Fl. Ind. iii, 139; Royle Ill. 102; F. B. I. i, 374; Watt E. D.* Riedleia corchorifolia, *DC.; W. & A. Prod. 66; D. & G. Bomb. Fl. 24.* R. truncata, *W. & A. l.c.*

An erect branching herb or undershrub, thinly stellate-hairy. *Leaves* variable in size and shape, 1-3 in long, oblong-ovate, rarely lobed, often plaited, rounded truncate or cordate at the base, subglabrous above, thinly stellate-hairy beneath, base 5-nerved; *petiole* about 1 in.; *stipules* small, lanceolate, ciliate. *Flowers* small, nearly sessile, in dense terminal or axillary clusters, with many hispid bracteoles intermixed. *Sepals* lanceolate, acuminate. *Petals* obovate, white or pink, longer than the sepals. *Capsule* small, depressed-globose, hispid. *Seeds* angular, mottled.

Common within the area. DISTRIB.: Hotter parts of India, ascending the Himalaya to 4,000 ft.; also in Ceylon and the Malay Penins. A widely diffused tropical weed.

M. arborea, Blanco. This, under the name of *Visenia umbellata*, is recorded by Munro as having been found at Agra. The allusion is probably to cultivated specimens.

8. WALTHERIA, Linn.; Fl. Brit. Ind. i, 374.

Herbs or undershrubs. *Leaves* simple; *stipules* linear. *Flowers* small, in dense axillary or terminal clusters. *Sepals* 5, connate below into a bell-shaped tube. *Petals* 5, oblong-spathulate. *Stamens* 5, tubular below; anther-lobes parallel. *Staminodes* 0, Ovary sessile, 1-celled, 2-ovuled; *style* eccentric; *stigma* clavate. *Capsule* 2-valved, 1-seeded. *Seed* albuminous.—Species about 30, mostly tropical American.

W. indica, *Linn. Sp. Pl. 673; W. & A. Prod. 67; D. & G. Bomb. Fl. 23; F. B. I. i, 374.*

A pubescent undershrub. *Stems* 1-3 ft., erect or procumbent, slightly branched. *Leaves* 1-3 in., shortly stalked, ovate or oblong-ovate, rounded or cordate at the base, crenate-serrate, plicate, velvety on both sides; nerves prominent beneath; *petiole* short, woolly. *Bracteoles* linear, ciliate. *Calyx* villous, teeth lanceolate, acuminate, ciliate. *Petals* longer than the calyx, clawed. *Capsule* small, included in the calyx, membranous. *Seeds* smooth, black.

Common within the area. DISTRIB.: Hotter parts of India and in Ceylon, ascending to 4,000 ft. in Kumaon; widely diffused in tropical countries.

9. ABROMA, Jacq.; Fl. Brit. Ind. i, 375.

Trees or shrubs. *Leaves* cordate, ovate-oblong, serrulate, sometimes angled. *Peduncles* opposite the leaves, few-flowered. *Sepals* 5, connate near the base. *Petals* 5, purplish, concave below, prolonged above into a large spoon-shaped lamina. *Staminal* cup of 5-

fertile and as many sterile divisions; fertile filaments opposite the petals, each bearing 3 anthers. *Staminodes* longer than the fertile filaments, obtuse or obcordate. *Ovary* sessile, pyramidal, 5-lobed; cells many-ovuled; *styles* 5. *Capsule* membranous, with 5 prominent angles, truncate at the apex, septicidally 5-valved; valves villous at the edges. *Seeds* many, albuminous.—Species 2 or 3, inhabiting tropical Asia and Australia.

A. augusta, *Linn. f. Suppl. 341 (Ambroma); Roxb. Fl. Ind. iii, 156; W. & A. Prod. 65; Royle Ill. 102; F. B. I. i, 375; Field & Gard. Crops iii, 58; Watt E. D.* Vern. *Ulatkambal.*

A large shrub or small tree with downy branches. *Leaves* 3½-6 in. long, narrowed to the 3-7 nerved base, repand-denticulate, glabrescent above, tomentose below; *stipules* linear, deciduous, as long as the petiole. *Peduncles* 1½ in., axillary. *Flowers* 2 in. across. *Calyx*-lobes lanceolate, free nearly to the base. *Petals* slightly exceeding the sepals, imbricate in bud, deciduous. *Capsule* 1½-2 in. in diam., thrice as long as the persistent calyx, glabrous or nearly so when ripe.

Dehra Dun. DISTRIB.: widely spread throughout the hotter parts of India, often cultivated, ascending to 4,000 ft. on the Eastern Himalaya; also in Java, the Philippines and China. The bark yields an excellent fibre, which has been recommended as a substitute for hemp.

XXIII.—TILIACEAE.

TREES, shrubs or herbs. *Leaves* alternate, rarely opposite, simple and sometimes lobed. *Stipules* free, often caducous. *Flowers* usually cymose, regular, mostly 2-sexual. *Sepals* 3-5, free or connate, valvate. *Petals* as many as the sepals, rarely 0, imbricate or valvate. *Stamens* many, rarely definite, free or sometimes 5-adelphous, usually springing from a prolonged or dilated torus; *anthers* 2-celled. *Ovary* free, 2-10-celled; *styles* columnar, or divided into as many divisions as there are cells to the ovary; *stigmas* usually distinct; *ovules* attached to the inner angles of the cells, pendulous or ascending if few, or in 2 or more ranks if numerous. *Fruit* dry or fleshy, dehiscent or indehiscent, 2-10-or by abortion 1-celled, cells sometimes divided by false partitions. *Carpels* separable or always united. *Seeds* 1 or many, ascending, pendulous or transverse, aril 0; albumen fleshy, rarely wanting.—Species about 350, inhabiting chiefly the tropical regions of both hemispheres.

The hard tubercled nuts of certain species of *Elæocarpus* are made into rosaries and bracelets. *E. Ganitrus,* Roxb., Vern. *Rudrak,* is occasionally seen as a planted tree near temples within the area. The genus

Tilia, which gives the name to this family, comprises the Linden or Lime-trees of Europe.

Trees or shrubs, fruit indehiscent . .	1. GREWIA.
Herbs—	
Fruit indehiscent, spiny . . .	2. TRIUMFETTA.
Fruit a 2-5-valved capsule . . .	3. CORCHORUS.

1. GREWIA, Linn.; Fl. Brit. Ind. i. 383.

Trees or shrubs, more or less stellate-pubescent. *Inflorescence* usually axillary. *Sepals* 5, distinct. *Petals* 5, rarely 0, smaller than the sepals, with usually a glandular scale within at the base. *Stamens* and *ovary* usually on a raised torus or gynophore. *Stamens* many, distinct. *Staminodes* 0. *Ovary* 2-4-celled, with 2 or more ovules in each cell; *style* subulate; *stigma* shortly lobed. *Drupe* fleshy or crustaceous, entire or 2-4-lobed, containing 4 bony stones, which are often divided into 2 or more false cells and 1-6-seeded. *Seeds* ascending; albumen fleshy, rarely 0.—Species about 90, confined chiefly to Tropical Asia and Africa, a few also occurring in the islands of the Malay Archipelago and in N. Australia.

There is usually at the base of each petal a conspicuous gland, and this is correlated with a distinct gynophore. In some species, however, the petals have no thickened gland at the base, and there is no gynophore. As both forms of petals sometimes occur in the same species, the difference in character must be interpreted as representing a kind of sexual dimorphism. Petals with no thickened basal glands have been found by the writer in the following species:—*G. orbiculata*, *G. tiliæfolia*, *G. vestita and G. elastica*, and in the last-mentioned species the glandless condition almost invariably occurs. In *G. asiatica*, which is abundant within the area, the petals are always provided with a conspicuous gland and an obvious gynophore. Sir Dietrich Brandis, who first drew the writer's attention to the occasional absence of these basal glands, has informed him that he has found them wanting also in *G. elatostemmoides*, Coll. and Hemsl., in *G. eriocarpa*, Juss., and in a few other extra-Indian species.

The following key has been prepared mainly with a view to the presentation of characters which are more obvious than such as should be used in a strictly natural classification. Of the 18 species occurring within the area of the Upper Gangetic Plain, eight are endemic in India.

Flowers in terminal and axillary cymes . .	1. *G. columnaris*.
Peduncle generally single and opp. the leaves.	
A tree; flowers in umbellate cymes . .	2. *G. oppositifolia*.
A shrub; peduncle 1-2-flowered . . .	3. *G. populifolia*.

Flowers axillary.

Drupe when dry with a distinct crustaceous or coriaceous rind.

Leaves oblong, 3-nerved; drupes small, on long pedicels . . . . . 4. *G. pilosa.*

Leaves orbicular, cordate, 5-nerved; drupes large, clustered, nearly sessile . . . 5. *G. villosa.*

Leaves ovate or obovate, scabrous above, 3-5-nerved; drupes large, shortly stalked . 6. *G. scabrophylla.*

Drupe fleshy, wrinkled when dry, with no distinct rind.

Leaves broad, suborbicular or obliquely ovate, often cordate.

Trees; peduncles shorter than or not much exceeding the petioles.

Main nerves nearly straight.

Young parts grey-or white-tomentose . 7. *G. vestita.*

Young parts fulvous-tomentose . . 8. *G. elastica.*

Main nerves arching.

Leaves thick, softly hairy on both sides; stipules lanceolate, falcate . . . . . 9. *G. asiatica.*

Leaves thin, becoming glabrous when mature; stipules transversely falcate and auricled at the base 10. *G. tiliæfolia.*

Leaves very scabrous on both surfaces . 11. *G. abutilifolia.*

Shrubs; peduncles much longer than the petioles.

Leaves cordate . . . . . 12. *G. orbiculata.*

Leaves not cordate. A dwarfed undershrub, throwing up annual herbaceous flowering stems . . 13. *G. sapida.*

Leaves lanceolate or ovate-lanceolate, 3-nerved at the base.

Flowers all 2-sexual.

A tree, with almost glabrous leaves . 14. *G. lævigata.*

Shrubs; leaves hoary or tomentose beneath.

Leaves glabrous above.

Petals entire . . . 15. *G. excelsa.*

Petals bifid . . . . 16. *G. salvifolia.*

Leaves hairy or scabrous above. . 17. *G. hirsuta.*

Flowers polygamous, mostly 1-sexual . 18. *G. polygama.*

1. G. columnaris, *Smith in Rees Cyclop. XVII, n. 5; F. B. I. i, 383; W. & A. Prod. 76; D. & G Bomb. Fl. 26.*

A much-branched shrub or small tree, young parts stellate-hairy. *Leaves* 2-3 in. long, oblong or oval, shortly acuminate, rounded and 3-nerved at the base, serrate, coriaceous, scabrous; secondary nerves arched; *petiole* ¼-½ in., stellate-tomentose. *Flowers* in terminal and axillary umbellate cymes. *Bracts* oblong. *Buds* conical, furrowed. *Sepals* ½ in. long, oblong-linear, pubescent outside. *Petals* ½ the length of the sepals, entire, with a large orbicular claw, densely hairy within. *Ovary* hairy; *style* longer than the stamens; *stigma* 4-fid. *Drupe* ½ in. in diam., turbinate, slightly 4-lobed, bristly, dark yellow.

Bundelkhand (Edgeworth). DISTRIB.: Bengal to S. India and Ceylon; also in Java and E. Trop. Africa.

2. G. oppositifolia, *Buch.-Ham. ex Roxb. Hort. Beng.; Fl. Ind. ii. 583; Royle Ill. 103; F. B. I. i, 384; Brand, For. Fl. 37, t. XII; Watt E. D.* Vern. *Bhinal, biul, behel, benwal.*

A medium-sized tree with ash-coloured bark; herbaceous portions rough with stellate hairs. *Leaves* about 3 in. long, bifarious, rhomboid-ovate, acuminate, crenate-serrate, scabrous above, pubescent beneath, 3-nerved at the rounded base; *petioles* ½ in., pilose; *stipules* linear-lanceolate, longer than the petioles, caducous. *Flowers* in umbellate cymes opposite the leaves, rarely terminal or axillary, white turning to yellow; *pedicels* clavate at the top. *Buds* oblong, cylindrical, ribbed. *Sepals* ½ in. long, linear, 3-ribbed on the back. *Petals* ½ the length of the sepals, entire. *Ovary* hairy; *style* equalling the stamens; *stigma* 2-lobed. *Drupe* 1-4-lobed, glabrescent or thinly pilose, blackish. *Nuts* 1-celled, 1-seeded, about the size of a small pea.

Dehra Dun and on both sides of the Siwalik range. DISTRIB.: Punjab Hills and W. Himalaya, up to 6,000 ft. Flowers April to June, and the fruit ripens October to December. The bark yields a coarse fibre of which ropes and nets are made by the inhabitants of the W. Himalaya, who often plant the tree for this purpose near their villages; the foliage is also stored by them as winter fodder for cattle and sheep. The wood is tough and elastic.

3. G. populifolia, *Vahl. Symb. i, 33; W. & A. Prod. 80; F. B. I. i. 385; Brand. For. Fl. 38; Watt E. D.* G. betulifolia, *Juss.; Royle Ill. 103.*

A much-branched shrub; herbaceous portions more or less stellate-hairy, ultimately glabrescent. *Leaves* ½-1½ in. long, variable in shape, crenate-serrate, coriaceous, glabrous, cuneate-obovate and 3-5-nerved at the base; secondary nerves obscure, not arched; *petiole* ½ in. *Peduncles* solitary, opposite the leaves, 1-or rarely 2-flowered. *Buds* ribbed. *Sepals* linear-oblong. *Petals* narrowly oblong, shorter than the sepals. *Ovary* hairy, at length glabrescent. *Drupe* usually 2-lobed, orange-red; lobes about the size of a small pea. *Nuts* 1-2-celled.

Merwára. DISTRIB.: Punjab, Sindh, Rajputana to S. India and Ceylon; also in Afghanistan, Arabia, Trop. Africa and Mauritius. Flowers during the rains. The small acid fruit is eaten.

4. G. pilosa, *Lamk. Encycl. Suppl. iii, 43; W. & A. Prod. 78; D. & G. Bomb. Fl. 26; F. B. I. i, 388; Brand. For. Fl. 39.* G. carpinifolia, *Roxb. Fl. Ind. ii, 587.*

A shrub or small tree; herbaceous portions rough with stellate hairs. *Leaves* 2-4 in. long, subsessile, cuneate-obovate or lanceolate, shortly acuminate, unequally serrate, scabrous above, softly tomentose and prominently veined beneath; base rounded or subcordate, 3-nerved: *stipules* subulate, acuminate. *Peduncles* 1-3, axillary, ½ in. long, 3-flowered; *pedicels* as long as the peduncle. *Buds* oblong, dilatediat the base, constricted in the middle. *Sepals* linear ½ in. *Petals* linear, bifid, one-third the length of the 1 sepals. *Drupe* 1-4-lobed, reddish-brown, stellate-hairy, size of large pea, rind crustaceous, mesocarp fibrous. *Nuts* 1-4, 1-3 celled, pitted.

Rohilkhand, Oudh, Bundelkhand, Merwára. DISTRIB.: Rajputana, C. and S. India; also in Trop. Africa.

5. G. villosa. *Willd. in Ges. Nat. Fr. Neue. Schr. iv, 205; W. & A. Prod. 79; D. &. G. Bomb. Fl. 25; F.B.I. i, 388; Brand. For. Fl. 39; Watt E. D.*

A shrub; herbaceous portions clothed with long soft hairs. *Leaves* 1-3 in., suborbicular, obliquely cordate at the base, apex acuminate or rounded, serrate, teeth ciliate, rugose above, villous beneath, and with 5 prominent basel nerves; *petiole* ½-1 in.; *stipules* broad, leafy. *Flowers* very shortly peduncled, sometimes opposite the leaves. *Bracts* oblong. *Sepals* oblong, acute, villous. *Petals* oblong, notched, much shorter than the sepals, dull yellow. *Drupe* large, globose, rind crustaceous, copper-coloured, pilose. *Nuts* 4, 1-2 seeded.

Bundelkhand. DISTRIB.: Punjab, Sindh, Rajputana, and south to Travancore; also in Trop. Africa and the Cape de Verd Islands. Flowers from June to September.

6. G. scabrophylla. *Roxb. Fl. Ind. ii, 584; F. B. I. i, 387; Watt E D.* G. sclerophylla, *Roxb.; Brand. For. Fl. 39.* Vern. *Phársia, gárbheli* (Dehra Dun).

A small shrub with brownish-green scabrous bark; herbaceous portions densely pubescent. *Leaves* 3-6 in. long, roundish or obliquely ovate, often sublobate, doubly serrate, scabrous on the upper surface, densely rufous-tomentose and with prominent veins beneath; base 3-5-nerved, rounded or subcordate, secondary nerves not arched; *petiole* short; *stipules* subulate, hairy, caducous. *Peduncles* 1-4, axillary, 2-3-flowered, equalling the petiole. *Buds* ovate-oblong, ribbed. *Flowers* ¾ in. across. *Sepals* linear-lanceolate, pubescent outside. *Petals* obovate, notched, white, ½ the length of the sepals. *Style* longer than the stamens; *stigma* 2-lobed. *Drupe* subglobose, about the size of a large cherry, stellate-hairy; *pulp* glutinous, pale yellow. *Nuts* 4, 1-celled, 1-seeded.

Submontane tracts from Dehra Dun and the Saharanpur district to Pilibhit and N. Oudh. DISTRIB.: Trop. Himalaya from Garhwál to Sikkim, ascending to 4,000 ft.; also in Assam, E. Bengal and Burma. It flowers during Aug. and Sep. and the fruit ripens Nov. to March. The stems yield a fibre suitable for ropes, and the fruit is eaten.

7. **G. vestita**, *Wall. Cat. 1105; Brand. For. Fl. 40* (*in part*); G. asiatica, *Linn., var.* vestita, *F. B. I. i, 387* (*in part*); *Watt E. D.* (*in part*).

A small tree; young parts, underside of leaves and inflorescence clothed with soft grey or white tomentum. *Leaves* 3-5½ in. long, obliquely ovate or ovate-oblong, rounded or tapering at the base, rarely cordate, acuminate and often obscurely 3-lobed at the apex, rough with stellate hairs on upper surface, densely white or grey-tomentose beneath, coriaceous, serrate, 5-7-nerved at the base, the main nerves much straighter than in *G. asiatica*; *petioles* ⅜-½ in., tomentose; *stipules* subulate, shorter than the petioles. *Peduncles* 2-3-flowered, equalling or exceeding the petioles, pilose. *Buds* oblong, woolly, indistinctly ribbed. *Sepals* linear-lanceolate, glabrous inside. *Petals* broadly oblong, yellow, with or without a gland at the base. *Ovary* densely pilose; *style* equalling the stamens. *Drupe* globose or indistinctly lobed, size of small pea, pilose.

Dehra Dun, Siwalik range, N. Oudh. DISTRIB.: Chota Nagpur, ? Shan Hills.

8. **G. elastica**, *Royle Ill. 104, t. 22.* G. asiatica, *Linn., var.* vestita *F. B. I. i, 387* (*in part*); *Watt E. D.* (*in part*). G. vestita, *Wall.*; *Brand. For Fl. 40* (*in part*). Vern. *Dhâman.*

A small tree, 15-20 ft. high. Older branches smooth; young parts, under surface of leaves and inflorescence densely hoary or rufous with stellate pubescence. *Leaves* 2½-5½ in. long, obliquely ovate, acuminate and often 3-lobed at the apex, crenate-serrate, often brownish-green above and stellate-hairy, densely clothed beneath with white or tawny tomentum; principal nerves 5-6 at the base, and straight as in *G. vestita*, secondary ones transverse; *petioles* about ¼ in., thickened upwards; *stipules* subulate, falcate, exceeding the petioles, hairy. *Peduncles* axillary or extra-axillary, longer than the petioles, 3-flowered. *Buds* globose, densely woolly, not ribbed. *Flowers* about the size of those of G. *vestita*. *Sepals* 1-nerved, reddish and smooth inside. *Petals* less than ½ the length of the sepals, oblong, yellow, usually without a basal gland. *Stamens* many, shorter than the style. *Drupe* small, obscurely lobed. *Nuts* 1-2.

Forests of Bijnor, N. Oudh and Gorakhpur. DISTRIB.: Outer Himalayan ranges from Hazára eastward to Sikkim; also in Assam and in Chota Nagpur. Flowers during May and June. This is a very distinct tree from *G. vestita*, to which it has been reduced in the Fl. Brit. Ind., and by Brandis and other authors. It may be easily distinguished by the rufous-coloured tomentum of the young parts and under surface of the leaves, the shorter petioles, the small globose buds without ribs, the thin glandless petals, and by the very small drupes. It is probably also a better known tree than the other, especially on the Himalaya, by reason of its tough and elastic timber, on which account Royle so named it.

9. **G. asiatica**, *Linn. Mant. i, 122; Roxb. Fl. Ind. ii, 596; W. & A. Prod. 79; Royle Ill. 104; D. & G. Bomb. Fl. 26; F. B. I. i, 386; Brand. For. Fl. 40; Watt E. D.* Vern. *Phalsa, dhâman.*

Usually a medium-sized tree; young shoots, under surface of leaves and inflorescence clothed with soft grey or yellowish tomentum. *Leaves*

3-6 in long, orbicular or broadly ovate, obliquely rounded or more or less cordate at the base, rounded acute or acuminate at the apex, and often sublobate, softly tomentose on both surfaces, becoming less hairy when mature and rough on the upper surface, crenate or serrate, usually 5-nerved at the base, nerves not arched, prominent below and conspicuous in the young leaves; *petioles* ½-¾ in. long; *stipules* lanceolate, falcate, often with a broad oblique base. *Peduncles* axillary, 2-4, longer than the petiole, 3-flowered; *pedicels* clavate at the top, shorter than the peduncles, spreading. *Buds* cylindrical or clavate, densely tomentose, distinctly ribbed. *Sepals* whitish tomentose outside, reddish-brown or yellow inside. *Petals* red and yellow, emarginate, ¼ the length of the sepals, glandular at the base. *Style* equalling the stamens; *stigma* 4-lobed. *Drupe* indistinctly lobed, pilose, ⅜ in. in diam., containing 1-2 one-celled nuts.

Common in the forests of Dehra Dun, and on both sides of the Siwalik range: also in Rohilkhand, Oudh, Merwára, and Bundelkhand. DISTRIB.: Salt range in the Punjab, W. Himalaya up to 3,000 feet, C. and S. India and Ceylon, but often cultivated for its fruit. The tree varies very much as to the size, colour, and the amount of pubescence of its leaves, also in the length of the petioles. Mr. U. Kanjilal of the Forest Department, who knows the tree very well, tells me that it also varies greatly in habit, growing sometimes more like a shrub with a short trunk and long straggling branches, whilst usually it grows to a fair-sized tree, up to 35 feet, and with a trunk nearly 1 ft. in diam. In cultivated specimens the leaves often become very large, and almost glabrous when mature. The wood resembles that of *G. elastica*, and is used for the same purposes. The mucilaginous juice of the bark is used by sweetmeat-makers for clarifying sugar.

10. G. tiliaefolia, *Vahl Symb. Bot. i, 35; Roxb. Fl. Ind. ii, 587; W. & A. Prod. 80; Royle Ill. 103; D. & G. Bomb. Fl. 26; F. B. I. i, 386; Brand. For. Fl. 41; Watt, E. D.*

A moderate-sized tree; young portions hoary-tomentose, at length glabrous. *Leaves* usually from 3-6 in. long, rhomboid-ovate, obliquely cordate, rounded or acuminate at the apex, sometimes obscurely lobed, unequally serrate, thinly cartilaginous, usually somewhat rough above, pale and glabrescent beneath when mature; basal nerves 5-7; *petioles* ½-1 in; *stipules* transversely falcate and usually broadly auricled on one side. *Peduncles* many, axillary, 3-or 4-flowered, equalling or shorter than the petioles. *Buds* oval or oblong, ribbed. *Sepals* linear, pubescent outside. *Petals* oblong, ½ the length of the sepals, often without a basal gland. *Style* 4-lobed, exceeding the stamens. *Drupe* globose, of the size of a small pea, indistinctly 2-lobed. *Lobes* with 2 hemispherical 3-celled nuts, or with one spherical 6-celled nut.

Dehra Dun, Pilibhit, N. Oudh, Merwára, but not common; it probably also occurs on the Siwalik range, and in Bundelkhand. DISTRIB.: Bengal, C. & S. India, Ceylon, Burma; also in E. Trop. Africa. The inner bark is used for ropes and the fruit is eaten. This species has been much confused with *G. asiatica*, from which it may be distinguished by the broad falcate auricled stipules, and by its thin and usually glabrous mature

leaves. The petals frequently want the basal gland, as shown in Beddome's *Flora Sylv., t.* 108 and in specimens collected by the writer in Merwára. Gamble's No. 11388 from the Nilgiris, and a specimen collected by Wight at Jamalay have also glandless petals, and the flowers are much smaller than usual.

11. G. abutilifolia, *Vent. ex Juss. in Ann. Mus. Par. iv, 92; W. & A. Prod. 79; D. & G. Bomb. Fl. 26; F. B. I. i, 390.* G. aspera, *Roxb. Fl. Ind. ii, 591.* Vern. *Dhâma* (Bundelkhand).

A small tree; herbaceous portions scabrous with stellate hairs. *Leaves* 3-6 in long, roundish or obliquely ovate, cordate or rounded at the base, rounded or abruptly acuminate at the apex, rough on both surfaces with stellate hairs, base 3-5-nerved; *petiole* ½-¾ in. *Peduncles* in axillary clusters, 3-4-flowered, ½ the length of the petiole. *Buds* oblong, pilose. *Flowers* ¾ in. across. *Sepals* ½ in., oblong *Petals* oblong, entire, much shorter than the sepals. *Ovary* hispid; style equalling the stamens. *Drupe* subglobose or turbinate, obscurely 4-lobed, size of large pea, pubescent. *Nuts* 4, 1-or 2-celled.

Bundelkhand, DISTRIB.: C. & S. India, Burma, Java.

12. G. orbiculata, *Rottl. in Ges. Naturf. Fr. Neue Schr. iv, 205; F. B. I. i, 386;* G. rotundifolia, *Juss.; W. & A. Prod. 80.*

A shrub with rod-like branches. *Leaves* 1-3 in. long, roundish, elliptic or oblong, cordate, base often oblique, unequally crenate-serrate, pubescent on both surfaces, hoary beneath, 5-nerved at the base, nerves arched; *petioles* ¼-½ in.; *stipules* subulate. *Peduncles* 3-flowered, longer than the petioles, pilose; *pedicels* shorter than the peduncles, divaricate. *Bracteoles* minute, pinnatifid. *Buds* ovoid-oblong, ribbed. *Flowers* yellow, ¼ in diam. *Sepals* linear. *Petals* ½ the length of the sepals, with or without basal glands, notched. *Ovary* villous. *Drupe* slightly 2-lobed, pilose *Nuts* 1-2, 2-celled.

Aligarh district, Bundelkhand, Merwára. DISTRIB.: C. and S. India. The fruit ripens during the cold season. The Merwára specimens have no glands at the base of the petals, and there is no gynophore.

13. G. sapida, *Roxb. Hort. Beng. 42; Fl. Ind. ii, 590; Royle Ill. 103; F. B. I. i, 387; Brand. For. Fl. 41;* G. pumila, *Buch-Ham.; Royle Ill. l.c.* Vern. *Phalsa, pharsia.*

A small undershrub, with a thick woody underground stem, from which are annually thrown up a number of pubescent herbaceous flowering shoots. Young parts hoary-pubescent. *Leaves* 3-5 in. long, ovate obovate or suborbicular, frequently sublobate, somewhat obliquely rounded or cuneate at the base, rounded acute or acuminate at the apex, upper surface scabrous with stellate hairs and often tinged with red, more or less hoary-pubescent beneath, doubly serrate, 5-nerved at the base, the secondary nerves not arched; *petioles* less than ½ in.; *stipules* falcate, broad and sometimes auricled at the base, equalling the petiole. *Peduncles* slender, 2-5-flowered, much longer than the petioles. *Buds* obovate-oblong, hoary, ribbed. *Flowers* yellow, ½ in. across. *Petals* entire or emarginate, ½ the

length of the sepals. *Drupe* about the size of a small pea. *Nuts* 1-3, one-seeded.

Submontane tracts, from Dehra Dun and the Siwalik range to Gorakhpur, usually in open ground. DISTRIB.: Trop. Himalaya from Garhwal to Bhutan, also in Chota Nagpur. Flowers during April and May, and the fruit ripens in October and November. This plant is one of those which are characteristic of certain tracts of country where jungle fires take place periodically. The leaves are used as fodder, and the fruit is edible.

14. G. lævigata, *Vahl Symb. Bot. i, 34; W. & A. Prod. 77; F. B. I. i, 389; Brand. For. Fl. 42; Watt E. D.* G. didyma, *Roxb. Fl. Ind ii, 591;* Vern. *khatbhemal*, *phirsan* (Dehra Dun), *kakki* (Oudh).

A small tree; herbaceous portions thinly stellate-hairy. *Leaves* 3-6 in long, elliptic-lanceolate, tapering at each end, pilose on the nerves beneath, serrate, 3-nerved at the base, secondary nerves arched; *petioles* about ½ in.; *stipules* linear-subulate, pilose. *Buds* ovoid, ribbed, pubescent. *Peduncles* 2 or 3 together, 2-3-flowered, longer than the petioles, pilose. *Sepals* 3-nerved, pubescent outside. *Petals* much shorter than the sepals, yellow, blade very short. *Torus* glabrous. *Style* longer than the stamens. *Drupe* 2-lobed, size of small pea, smooth and black when ripe. *Nuts* 2, 1-2-celled.

Dehra Dun, Siwalik range, Oudh. DISTRIB.: Outer Himalaya from the Jumna to Sikkim, ascending to 3,000 ft., Assam, Khasia Hills, Bengal, South India, Burma; also in the Malay Islands, Australia and Trop. Africa. Flowers June to September, and the fruit ripens during the cold season. The leaves are used as fodder.

15. G. excelsa, *Vahl Symb. Bot. 35; Roxb. Fl. Ind. ii, 586; F. B. I. i, 385; Watt E. D.* G. Rothii. DC.; *W. & A. Prod. 78; Brand. For. Fl. 43;* G. salvifolia, *Roxb. l.c. 537 (not of Heyne).*

A shrub. *Leaves* 4-5 in. long, unequally ovate oblong or lanceolate, acuminate, serrulate, 3-nerved at the rounded base; nerves arched; transverse ones prominent; *petiole* ½-¾ in.; *stipules* ensiform, longer than the petioles. *Peduncles* 3-flowered, much longer than petioles. *Flowers* ½-¾ in. across. *Sepals* linear. *Petals* oblong, entire, ½ the length of the sepals. *Drupe* globose, pubescent, about the size of a pea. *Nuts* 2, one-celled.

Bundelkhand (Edgeworth). DISTRIB.: E. Bengal, Sikkim, Chittagong, Coromandel; also in Trop. Africa. Flowers during the hot season. The fruit is eaten.

16. G. salvifolia, *Heyne ex Roth Nov. Pl. Sp. 239; W. & A. Prod. 77; F. B. I. i, 386; Brand. For. Fl. 43; Watt E. D.* Vern. *Hiris* (Merwára).

A shrub or small tree with grey bark; herbaceous portions hoary with soft pubescence. *Leaves* 1½-4 in. long, ovate-lanceolate or oblong, obtuse or bluntly acuminate, entire or minutely serrate, rounded at the base and 3-nerved, glabrescent and often with a reddish-brown colour above, hoary beneath; transverse nerves indistinct; *petioles* about ¼ in.; *stipules* subulate. *Peduncles* 1-3, longer than the petioles. *Buds* oval or cylindrical, ribbed. *Sepals* linear, 3-nerved. *Petals* obovate, smaller than the sepals

limb bifid, yellow, from the back of the thickened claw. *Ovary* pubescent; *style* equalling the stamens. *Drupe* 1-4-lobed, about the size of small pea, glabrous.

Oudh forests, and in Merwára. DISTRIB.: Punjab, Sindh, C. and S. India, also in Trop. Africa. Flowers in Feb. and March. The subacid fruit is eaten.

17. **G. hirsuta**, *Vahl Symb. Bot. i, 34; Roxb. Fl. Ind. ii, 587; W. & A. Prod. 78; F. B. I. i, 391; Brand. For. Fl. 42.* G. pilosa; *Roxb. l. c. 588 (not of Lamk.).* Vern. *Phrongli* (Merwara).

A shrub. Branchlets stellate-hairy. *Leaves* 2-3½in. long, distichous, ovate or lanceolate, acuminate or obtuse at the apex, obliquely rounded or subcordate at the base, irregularly serrate, hairy and scabrous above, densely tomentose beneath, 3-nerved at the base; *petioles* very short; *stipules* linear or subulate, longer than the petiole. *Peduncles* 1-3, axillary, 2-3-flowered. *Bracts* ovate-lanceolate, equalling the short pedicels. *Buds* oblong, obtuse, pilose. *Flowers* ½ in. across, white turning to yellow. *Sepals* lanceolate, ¼ in. or less, hairy outside. *Petals* oblong, entire, ½ the length of the sepals. *Ovary* very hairy. *Drupe* 4-lobed, smooth or with a few bristles, size of large pea. *Nuts* 4, 2-celled.

Merwára, Gwalior, Saugor (Jerdon). DISTRIB.: Chota Nagpur, S. India, Ceylon, Burma. Very similar to some states of *G. pilosa*.

18. **G. polygama**, *Roxb. Hort. Beng. 42; Fl. Ind. ii, 588; D. & G. Bomb. Fl. 26; F. B. I. i, 391; Brand. For. Fl. 42; Watt E. D.* G. lanceæfolia, *Roxb. l.c. 586.*; G. helicterifolia, *Wall.*; *Royle Ill. 103.*

A shrub; herbaceous portions grey-tomentose; branches spreading, bifarious. *Leaves* 3-4 in. long, subsessile, lanceolate, acuminate, usually rounded at the base, sharply serrate, downy on both surfaces, much paler beneath, base 3-nerved, nerves not arched; *stipules* subulate. *Peduncles* 1-5, axillary, 2-6-flowered, longer than the petioles; *pedicels* shorter than the peduncle. *Flowers* polygamous, mostly 1-sexual. *Sepals* linear, villous outside, longer than the oblong entire petals. *Stamens* numerous. *Ovary* roundish, hairy; *styles* longer than the stamens; *stigmas* large, stellate. *Drupe* ¼ in. in diam., obscurely 4-lobed, brownish, shining, clothed with a few long scattered hairs. *Nuts* 4, 1-seeded, about the size of a small pea.

Dehra Dun, Siwalik range, Rohilkhand, Oudh, Bundelkhand. DISTRIB.: Punjab on the Salt Range; base of W. Himalaya and eastward to Nepal, ascending to 4,000 ft., Assam and south to Ceylon, Burma; also in N. Australia. Flowers in July and Aug., fruit ripens Nov.-December. Various portions of this plant are used medicinally, and the fruit is eaten.

2. TRIUMFETTA, Linn.; Fl. Brit. Ind. i. 394.

Herbs or undershrubs, more or less stellate-hairy. *Leaves* serrate and often lobed. *Flowers* small, yellow, in dense cymes opposite the leaves, or terminating the branches. *Sepals* 5, oblong, concave. *Petals* 5, distinct. *Stamens* 5-25, distinct, springing from a fleshy

lobed glandular torus. *Ovary* 2-5-celled, with 2 ovules in each cell; *style* filiform, *stigma* 5-toothed. *Fruit* globose or oblong, spiny or bristly, indehiscent or 3-6-valved. *Seeds* 1-2 in. each cell, pendulous, albuminous.—Species about 60, mostly tropical weeds.

Fruit globose or ovoid	
Fruit large; spines long, hispid on their lower edges	1. *T. pilosa.*
Fruit very small; spines short, glabrous, not dilated at base	2. *T. rhomboidea.*
Fruit small; spines pubescent, dilated at base	3. *T. rotundifolia.*
Fruit oblong, spines ciliate on upper edges .	4. *T. neglecta.*

1. T. pilosa, *Roth Nov. Sp. 223; W. & A. Prod. 74; D. & G. Bomb. Fl. 25; F. B. I. i, 394; Watt E. D.* T. oblongata, *Link.*; *Royle Ill 103.*

A herb, clothed with bulbous-based bristles. *Leaves* stalked, stellate-hairy on both sides; lower 3-lobed; upper 3½-4 in. long, ovate or ovate-lanceolate, unequally toothed; petiole ¾ in., villous; *stipules* and peduncles shorter than the petiole. *Sepals* linear, apiculate. *Petals* oblong-spathulate, about as long as the sepals, ciliate at the base. *Stamens* about 10. *Fruit* (including spines) about the size of a cherry, 4-celled, 8-seeded; spines long, sharply hooked, hispid on their lower edges.

Abundant within the area, flowering during the rainy season. DISTRIB.: Throughout the hotter parts of India, and in Ceylon and Burma; also in tropical Africa.

2. T. rhomboidea, *Jacq. Enum, Pl. Carib. 22; F. B. I. i, 395; Watt E. D.* T. angulata, *Lamk.*; *W. & A. Prod. 74, Royle Ill 103; D. & G. Bomb. Fl. 25;* T. Bartramia, *Roxb. Fl. Ind. ii, 463;* T. trilocularis *Roxb. l.c. 462.*

A herb or small shrub, glabrous or pubescent. *Leaves* polymorphous, 3-7-nerved, apex acute or somewhat 3-lobed. *Sepals* oblong, apiculate. *Petals* oblong, ciliate at the base. *Stamens* 8-15. *Fruit* about the size of a small pea, globose or ovoid, white-tomentose between the glabrous hooked spines.

Throughout the area. DISTRIB.: Himalaya up to 4,000 ft. and southward to Ceylon; also in the Malay Islands, China and Tropical Africa. A soft glossy fibre is obtained from the stems, and the plant is also used medicinally.

3. T. rotundifolia, *Lamk. Encycl. iii, 421; W. & A. Prod. 75; D. & G. Bomb. Fl. 25; F. B. I. i, 395.*

Suffruticose, with rough herbaceous stems. *Leaves* about 1½ in. long, suborbicular, glabrescent above, pale-tomentose beneath, unequally serrate, coriaceous. *Petiole* ¼ in. *Flowers* in interrupted racemes. *Sepals* apiculate, white-tomentose. *Petals* ciliate at the base. *Stamens* 15-25. *Fruit* globose, about the size of a pea, pubescent; spines with dilated bases, hooked, slightly pubescent or nearly glabrous.

In dry and rocky ground; Etawah, Gwalior, Bundelkhand, Merwára. DISTRIB.: Punjab, Bengal and southward to Mysore; also in Burma.

4. **T. neglecta**, *W. & A. Prod. 75; F. B. I. i, 396.*

An annual with roughish branching stems. *Leaves* roundish, 3-5-nerved at the base, 3-5-lobed, irregularly toothed, pubescent above, tomentose beneath; upper narrowed at both ends. *Flowers* small, in lateral extra-axillary clusters, or by the abortion of the leaves arranged in an interrupted raceme. *Sepals* linear. *Petals* oblong, obtuse, glabrous below. *Stamens* 5-10, filaments hairy on the back. *Fruit* oblong; spines hooked, ciliated on their upper edges.

Moradabad (T. Thomson), Lucknow, and probably elsewhere within the area, but not common. DISTRIB.: Behar and southward to S. India and Ceylon; also in Abyssinia and Senegal.

3. CORCHORUS, Linn.; Fl. Brit. Ind. i. 396.

Herbs or undershrubs, more or less stellate-pubescent. *Leaves* simple. *Peduncles* axillary or leaf-opposed, 1-3-flowered. *Flowers* small, yellow. *Sepals* 4-5. *Petals* 4-5, without glands. *Stamens* many or definite, springing from a short torus. *Ovary* 2-5-celled; *style* short; *stigma* cup-shaped; *ovules* many. *Capsule* elongated or subglobose, smooth or prickly, loculicidally 2-5-valved, sometimes with transverse partitions. *Seeds* many, albuminous, pendulous or horizontal.—Species about 30, throughout the tropics.

Capsule subglobose	1. *C. capsularis.*
Capsule cylindrical.	
Beak of capsule entire and erect.	
Annual or perennial herbs.	
Stamens many, capsule long.	
Capsule glabrous, beak long	2. *C. olitorius.*
Capsule scabrous or hispid, beak short	3. *C. triloculuris.*
Stamens 5-10; capsule short, hairy, shortly beaked	4. *C. fascicularis.*
A prostrate undershrub, capsule slender, stamens 8-10	5. *C. Antichorus.*
Beak of capsule 3-fid, tips spreading.	
Capsule long, slender, without wings	6. *C. tridens.*
Capsule short, stout, winged	7. *C. acutangulus.*

1. **C. capsularis**, *Linn. Sp. Pl. 529; Roxb. Fl. Ind. ii, 581; W. & A. Prod. 73; Royle Ill. 103; D. & G. Bomb. Fl. 25; F. B. I. i, 397; DC.*

L'Orig. Pl. Cult. 104; Watt E. D. Vern. *Harrawá* (Sháhjehánpur district).—Jute.

An erect glabrous annual. *Leaves* 2-4 in. long, ovate-lanceolate, acuminate, serrate, rounded at the base, the two lowest serratures produced into filiform deflexed tails; *petiole* 1½ in.; *stipules* filiform, as long as the petiole. *Flowers* less than ½ in. across, shortly stalked. *Capsule* subglobose, depressed at the apex, ½in. in diam., ridged and muricated, 5-celled. *Valves* woody, without transverse partitions. *Seeds* few in each cell, wedge-shaped, smooth, brown.

There are specimens in the Saharanpur herbarium from Dehra Dun, Rohilkhand, Gwalior and Bundelkhand; and Dr Royle has mentioned it as being common at Saharanpur. The Rohilkhand plant was found by the writer growing apparently wild on the banks of the Gumpti river near Indalpur. Regarding the other specimens there is no indication of their being other than of cultivated plants, or escapes from cultivation. DISTRIB.: Punjab, at Thanesar (Edgew.), Lahore (T.T.). Dr. Watt is of opinion that it may have been introduced into India as a cultivated plant from China or Cochin-China. The dried leaves are used medicinally in India as a remedy for dysentery, and this may account for its wide distribution in this country as a garden crop, or frequently an escape. For its fibre it is cultivated most extensively in E. Bengal.

2. C. olitorius, *Linn. Sp. Pl. 529; Roxb. Fl. Ind. ii, 581; W. & A. Prod. 73; Royle Ill. 103; D. & G. Bomb. Fl. 25; F. B. I. i, 397; DC. L'Orig. Pl. Cult. 103; Watt E. D.* C. decemangularis, *Roxb. l.c. 582.* —Jute, or Jew's Mallow.

Annual or perennial. This differs from the preceding chiefly by its elongated 3-6-valved capsules, the valves having transverse partitions between the seeds.

In the Saharanpur herbarium there are specimens from Dehra Dun, Moradabad, Bahraich District (Oudh), Agra, and Bundelkhand. It is probable that in every instance they were escapes from cultivation, as this plant is largely grown as a potherb all over India; so also in regard to Punjab specimens collected by Thomson, Edgeworth, Stewart and Aitchison. Dr. Watt has suggested the possibility of its having originated as a cultivated race derived from *C. triloculáris* or *C. acutangulus*. DeCandolle, however, believed it to be wild in the moderately warm regions of W. India, of Kordofan, and probably of some intermediate countries. In India it is cultivated for its fibre (jute) chiefly in the Burdwan district of Bengal.

3. C. triloculáris, *Linn. Mant. 77; W. & A. Prod. 72; Roxb. Fl. Ind. ii, 582; D. & G. Bomb. Fl. 25; F. B. I. i, 397; Watt E. D.*

Annual or perennial. *Leaves* 1-4 in. long, elliptic-oblong or oblong-lanceolate, crenate-serrate, with or without basal lobes; *petiole* very short, pilose. *Peduncles* very short, leaf-opposed. *Capsule* 2-3 in., straight or curved, 3-4-valved; *valves* 3-4-angled, with transverse partitions, scabrous; *beak* short, erect. *Seeds* obliquely truncate at the ends.

Meerut district, Bundelkhand, and probably elsewhere within the area. DISTRIB.: Punjab, Sindh and south to the Nilgiri Hills; also in Afghanistan and Trop. Africa.

4. C. fascicularis, *Lamk. Encyc. ii, 104; Roxb. Fl. Ind. ii, 582; Royle Ill. 103; D. & G. Bomb. Fl. 24; F. B. I. i, 398; Watt E. D.*

Annual or perennial. *Leaves* 1-2 in. long, oblong-lanceolate, serrate; *petioles* very short, pilose. *Peduncles* 2-5-flowered. *Stamens* 5-10. *Capsules* 3 or 4 together, short, subcylindric, hairy, shortly beaked; *valves* nearly destitute of internal partitions. *Seeds* trigonous, black.

Throughout the drier portions of the area, in the districts of Agra, Gwalior and Bundelkhand. DISTRIB.: Punjab, Sindh, Bombay, Bengal and south to Ceylon; also in Trop. Australia and Africa. The whole plant is mucilaginous and is used medicinally.

5. C. Antichorus, *Rœusch. Nom. Bot ed. iii, 158; F. B. I. i, 398; Watt E. D.* C. humilis, *Munro Hort. Agrens. 35; D. & G. Bomb. Fl. 25.* Vern. *Baphuli.*

A small woody prostrate perennial with tortuous branches. *Leaves* ½-¾ in. long, shortly stalked, roundish, plicate, crenate-serrate, base 3-nerved. *Peduncles* short, stout. *Stamens* 8-10. *Capsule* ½-1½ in. long, cylindric, slender, straight or curved, beaked, 4-valved.

In the drier portions of the area. DISTRIB.: Punjab, Sindh, Kathiawar, Gujrát and the Deccan, extending to Afghanistan, Aden, Trop. Africa and the Cape de Verd Islands. As a desert plant it is valued as fodder for camels.

6. C. tridens, *Linn. Mant. 566; W. & A. Prod. 73; F.B.I. i, 398; Watt E. D.*

Annual. *Leaves* 1-3 in. long, linear-oblong or lanceolate, shortly stalked. *Peduncles* 1-4-flowered. *Capsule* cylindric, 1-2 in. long, terminated by 3 spreading points, clothed with tufts of glandular hairs; *valves* without partitions. *Seeds* truncate at the ends, black.

Agra (Munro), Etawah (A. O. Hume). DISTRIB.: Throughout India also in Afghanistan, Australia and Africa.

7. C. acutangulus, *Lamk. Encycl. ii, 104; W. & A. Prod. 73; Royle Ill. 103; D. & G. Bomb. Fl. 25; F. B. I. i, 398; Watt E. D.* C. fusous, *Roxb.; Fl. Ind. ii, 592.*

Annual. *Leaves* 1-3 in. long, more or less hairy, ovate and acute or oblong and acuminate, serrate, with or without basal lobes; *stipules* linear-subulate, shorter than the petiole. *Peduncles* 2-3-flowered. *Capsule* short, 6-angled, 3 of the angles winged; beak 3-fid., divisions spreading horizontally; *valves* with or without partitions. *Seeds* 1-seriate in each cell, truncate at the ends.

Common throughout the area, and often mistaken for *C. olitorius*, when not in fruit. It flowers during the rainy and cold seasons. DISTRIB.: Hotter parts of India and in Ceylon; also in Australia, Trop. Africa and the W. Indies. Dr. Watt thinks it quite possible that from this species and *C. triloculuris* the cultivated forms of jute may have been produced.

XXIV.—LINEÆ.

HERBS or shrubs. *Leaves* usually alternate, simple, entire or crenate-serrate; *stipules* lateral or intrapetiolar or 0. *Inflorescence* various. *Flowers* regular, 2-sexual. *Sepals* 5, rarely 4, free or connate below, imbricate. *Petals* as many as the sepals, hypogynous or slightly perigynous, usually fugacious, often contorted. *Stamens* 4-5, with as many interposed staminodes, or 8-10, rarely more; *filaments* united at the base into a hypogynous or slightly perigynous ring, filiform; *anthers* versatile. *Glands* 5, entire or 2-lobed, usually adnate to the staminal ring, or obsolete.—This family is represented in most parts of the world. The famous Coca-plant is found in Peru and in other parts of South America.

Styles 5, capsule 5-celled	1. LINUM.
Styles 3-4, capsule 3-4-celled . . .	2. REINWARDTIA.

1. LINUM, Linn.; Fl. Brit. Ind. i, 410.

Annual or perennial herbs. *Leaves* narrow, entire; *stipules* 0. *Sepals* 5, entire. *Petals* 5, contorted, fugacious. *Stamens* 5, usually alternating with minute staminodes. *Glands* opposite the petals, adnate to the staminal ring. *Ovary* 5-celled; cells 2-locellate, 2-ovuled; *styles* usually free. *Capsule* 5-celled, septicidally splitting into 5 simple 2-seeded or into 10 one-seeded cocci. *Seeds* compressed; albumen scanty.—Species about 90, abundant in S. Europe.

Flowers blue, styles free . . .	1. *L. usitatissimum.*
Flowers yellow, styles connate below .	2. *L. mysorense.*

1. L. usitatissimum. *Linn. Sp. Pl. 277; Roxb. Fl. Ind. ii, 110; W. & A. Prod. 134; Royle Ill. 82; D. & G. Bomb. Fl. Suppl. 16; F. B. I. i, 410; D C. L'Orig, Pl. Cult. 95; Field & Gard. Crops, II, 40, t. xliv; Watt E. D.* Vern. *Alsi, tisi, bijri* (Bundelkhand)—Flax or Linseed.

Annual. Stems 2-4 ft., erect, usually corymbosely branched above. *Leaves* linear or lanceolate, without stipular glands, sub-3-nerved. Flowers in broad cymes, blue or sometimes white, 1 in. across. *Sepals* ovate, acuminate, 3-nerved, eglandular, margins white, ciliate or not. *Stigmas* linear-clavate. *Capsule* hardly exceeding the sepals; edges of valves ciliate.

Linseed is extensively grown within the area, especially in the Benares Division, in Bundelkhand and in the Sub-Himalayan tract. It is also found frequently as an escape in cultivated ground. It prefers a heavy soil, and is often sown in fields which have been occupied by rice. As the plant is grown in India only for its seed, it is sown much thinner

than in Europe, and consequently has developed a branching habit of growth, which would greatly lessen the value of its fibre. According to DeCandolle this species is indigenous in certain localities situated between the Persian Gulf, the Caspian and Black Seas. He traces the history of this plant and that of a perennial species named *L. angustifolium*, which latter appears to have been cultivated in very ancient times and to have been replaced by *L. usitatissimum* within the last 4 or 5,000 years.

2. **L. mysorense.** *Heyne ex Wall. Cat. 1507 ; W. & A. Prod. 134 ; Royle Ill. 82 ; D. & G. Bomb. Fl. 16 ; F. B. I. i, 411 ; Watt E. D.*

A small slender glabrous annual. Stem corymbosely branched above. *Leaves* ½-¾ in. long, elliptic-oblong, obtuse or acute, 3-nerved, without stipular glands. *Flowers* ¼ in. across, in panicled corymbs made up of unilateral cymes. *Sepals* with white glandular margins and short points. *Petals* yellow, exceeding the calyx. *Filaments* connate below, dilated above. *Styles* connate below ; *stigma* capitate. *Capsule* globose, equalling the calyx.

Bundelkhand. DISTRIB: Mt. Abu in Rajputana, W. Himalaya, 3-5,000 ft., and southward to the Deccan and Ceylon.

2. REINWARDTIA, Dumort ; Fl. Brit. Ind. i, 411.

Undershrubs. *Leaves* alternate, entire or crenate-serrate ; *stipules* minute, subulate, caducous. *Flowers* yellow, in axillary or terminal cymose fascicles, rarely solitary. *Sepals* 5, entire, lanceolate, acuminate. *Petals* 5, contorted, fugacious, much longer than the sepals. *Stamens* 5, hypogynous, connate below, alternating with as many interposed subulate staminodes. *Glands* 2-3, adnate to the staminal ring. *Ovary* 3-4-celled, cells 2-locellate ; *styles* 3-4, rarely 5 ; *stigmas* subcapitate ; *ovules* 1 in each locellus ; *Capsule* globose, splitting into 6-8 cocci. *Seeds* reniform.

R. indica, *Dum. Comm. Bot. 19.* R. trigyna *&* R. tetragyna, *Planch. ; F. B. I. i, 412 ; Watt E. D. R. trigyna,* Planch.; *D. & G. Bomb. Fl. 16.* Linum trigynum., *Roxb. Fl. Ind. ii, 110 ; W. & A. Prod. 134.* Vern. *Basant* (Dehra Dun).

A tufted glabrous undershrub, 2-3 ft. high, with erect and prostrate rooting rather stout soft branches. *Leaves* 1-3 in. long, elliptic-obovate, narrowed into slender petioles, usually rounded and mucronate at the tip, or acute or acuminate, entire or with a minutely crenate-serrate margin. *Flowers* often 1 in. across, but very variable. *Styles* 3 or 4, free or connate at the base. *Capsule* shorter than the sepals.

Dehra Dun, Siwalik range, Rohilkhand. DISTRIB.: Himalaya, from the Punjab to Sikkim, up to 7,000 ft. ; and southwards to the Bombay Ghats and the Nilgiri Hills. The flowers are dimorphic in regard to the relative length of the stamens and styles. *R. tetragyna* is described as having much larger lanceolate leaves. The 3-styled form (*R. trigyna*) is the one usually met with within the area of this flora, but the number of the styles is not a constant character.

XXV.—MALPIGHIACEÆ.

TREES or shrubs, often climbing. *Leaves* (in the Indian genera) opposite, entire; *stipules* small or 0. *Inflorescence* axillary or terminal; *pedicels* jointed, usually 2-bracteolate. *Flowers* usually white or yellow, hermaphrodite, regular or irregular. *Calyx* usually 5-partite; segments imbricate or valvate, 1 or more (not all) furnished with a large gland (eglandular in *Aspidopterys*). *Petals* 5, clawed or not; fimbriate, imbricate. *Disk* obscure. *Stamens* 10, hypogynous or sub-perigynous, equal or not; *filaments* free or connate below; *anthers* 2-lobed. *Ovary* 3-celled; *styles* 1-3, straight or circinnate; *stigmas* capitate or punctiform or lateral; *ovules* solitary in each cell. *Fruit* (of Asiatic genera) of one or more winged samaras. *Seed* exalbuminous. Largely represented in South America, less so in Africa and Asia.

Style 1; calycine gland large, adnate to the pedicel, petals unequal . . .	1. HIPTAGE
Styles 3, calycine glands 0, petals equal. .	2. ASPIDOPTERYS.

1. HIPTAGE, Gærtn.; Fl. Brit. Ind. i, 418.

Climbing or suberect herbs. *Leaves* opposite, coriaceous; stipules 0. *Racemes* terminal or axillary, simple or compound; *Peduncles* erect, bracteate, jointed on the 2-bracteolate pedicels. *Flowers* white, fragrant, the 5th petal discoloured. *Calyx* 5-partite. *Gland* large. *Petals* 5, clawed, unequal, silky. *Stamens* 10, all fertile, declinate, one larger than the rest; *filaments* connate at the base. *Ovary* 3-lobed, lobes appendiculate; *ovules* 1 in each cell; *styles* 1-2, circinnate. *Fruit* of 1-3 dry indehiscent winged 1-seeded nuts. *Seed* subglobose. —Species about 8, inhabiting Trop. Asia.

H. Madablota, *Gærtn. Fruct. ii, 169, t. 116; W. & A. Prod. 107; Royle Ill. 134; F. B. I. i, 418; Watt E. D.* Gærtnera racemosa, *Roxb.; Fl. Ind. ii, 368.* Vern. *Madhmalti, aneta* (Dehra Dun).

A large handsome woody evergreen climber, young parts and inflorescence silky. *Leaves* 3-6 in. long, oblong or ovate-lanceolate or acuminate, coriaceous, glabrous, shining above; petiole about ¼ in. *Racemes* axillary, usually forming a leafy panicle, silky-pubescent. *Flowers* about ¾ in. across, fragrant. *Sepals* obtuse. *Petals* twice as long, fimbriate, the 5th one yellow at the base. *Wings of carpels* oblong, coriaceous; inner 1-2 in., lanceolate-oblong; outer narrower and shorter, spreading.

Ravines and damp places in Dehra Dun, Rohilkhand and Oudh; often climbing on sál trees. DISTRIB.: Throughout the hotter parts of India;

also in China and Java. It flowers during the hot weather. The juice of the leaves is used medicinally.

2. ASPIDOPTERYS, Juss.; Fl. Brit. Ind. i, 419.

Shrubs, usually climbing. *Leaves* opposite, eglandular, entire exstipulate. *Flowers* in simple or compound axillary and terminal panicles; peduncles bracteate, jointed at the top; *pedicels* often, minutely 2-bracteolate. *Flowers* small, yellow or white. *Calyx* short, 5-partite, without glands. *Petals* 5, not clawed, spreading or reflexed, entire. *Stamens* 10, all perfect. *Ovary* 3-lobed, lobes flattened at the back, sides winged; *styles* 3. *Fruit* of 1-3 samaras, nucleus sometimes crested or winged at the back. *Seeds* oblong; subterete.—Species about 14, inhabiting Trop. Asia.

Leaves cordate.

Leaves ovate, acute or acuminate . . .	1. *A. Wallichii.*
Leaves orbicular, with a broad acumen .	2. *A. cordata.*
Leaves not cordate, shortly accuminate .	3. *A. nutans.*

1. A. Wallichii, *Hook. f. in F. B. I. i, 421.* A. nutans, *A. Juss.; Brand. For. Fl. 45.* Hiræa nutans, *Wall.*; *Royle Ill. 134.*

A tall climber with slender shoots. Inflorescence and lower surface of leaves densely clothed with appressed silky white tomentum. *Leaves* 4-7 in. long, ovate, acute or acuminate, base subcordate. *Flowers* ¼ in. in diam. in long lax white pendulous panicles. *Ovary* densely hispid with long white deciduous hairs. *Samaras* orbicular-oblong; nucleus without crest or wing.

Open parts of the Dehra Dun and Saharanpur forests. DISTRIB.: Garhwal and Kumaon Himalaya, up to 4,500 ft. Very handsome when in flower during the rainy season.

2. A. cordata, *A. Juss. in Ann. Sc. Nat. Ser. II, xiii, 267; D. & G Bomb. Fl. 33; F. B. I. i, 421.*

A slender climber. Shoots, inflorescence and leaves beneath clothed with white appressed tomentum. *Leaves* 5-8 in. in diam., orbicular cordate, terminated by a broad acuminate tip, opaque and sometimes pubescent above; *petiole* 1-1½ in. *Flowers* ¼ in. across, in lax pendulous panicles. *Ovary* villous. *Samaras* orbicular or nearly so; nucleus not winged or keeled.

Gonda district (Oudh). DISTRIB.: S. India.

3. A. nutans, *Hook. f. in F. B. I. i, 421 (not of A. Juss.).* Hiræa nutans, *Roxb. Fl. Ind. ii, 447 (not of Wallich).*

Very similar to *A cordata*, but usually less tomentose; the leaves are not cordate at the base and are often much larger and thinner and the

nerves are usually clothed with rusty tomentum: the upper surface of the leaves is reticulate and rather shining: the flowers too are a little larger, and the samaras are usually oblong.

Dehra Dun. DISTRIB.: Trop. Himalaya, from Nepal to Sikkim; also in E. Bengal, Assam, Chittagong, and Burma.

XXVI.—ZYGOPHYLLEÆ.

HERBS or shrubs, rarely trees. *Leaves* opposite (alternate in *Peganum*), stipulate, 2-3-foliolate pinnate or multifid, not punctate; *stipules* usually twin, persistent, sometimes spiny. *Peduncles* usually 1-2 in the axils of the stipules, or solitary subterminal and leaf-opposed. *Flowers* hermaphrodite, usually regular. *Sepals* 4-5. *Petals* 4-5, usually imbricate, rarely 0. *Disk* convex or depressed, rarely annular or 0, without glands. *Stamens* equal to or double the number of petals, rarely more (12-15 in *Peganum*), inserted at the base of the disk, often alternately longer. *Ovary* sessile or shortly stalked, lobed or winged, usually 4-5-celled; *style* angled or furrowed; *ovules* 2 or more in each cell. *Fruit* coriaceous or crustaceous, either of 5-12 free or united often spiny cocci, or capsular and septicidally dehiscent. *Seeds* usually pendulous and solitary (many in *Peganum*); albumen scanty, rarely 0.—Chiefly tropical or subtropical.

Stamens 10.	
Leaves abruptly pinnate, fruit spinous . .	1. TRIBULUS.
Leaves 1-3-foliolate, fruit not spinous . .	2. FAGONIA.
Stamens 12-15, leaves multifid	3. PEGANUM.

1. TRIBULUS. Linn.; Fl. Brit. Ind. i, 423.

Branching prostrate usually silky herbs. *Leaves* stipulate, opposite, abruptly pinnate; leaflets usually unequal. *Flowers* solitary, on pseudo-axillary peduncles, white or yellow. *Sepals* 5, imbricate. *Petals* 5, imbricate, spreading, fugacious. *Disk* annular, 10-lobed. *Stamens* 10, inserted on the base of the disk, alternately longer and shorter, the latter with a small gland outside; *filaments* filiform, naked. *Ovary* sessile, hirsute, 5-12-lobed and-celled; *style* short; *stigmas* 5-12; *ovules* superposed. *Fruit* 5-angled, of 5-12 winged or spinous or tuberculate indehiscent cocci. *Seeds* 2 or more in each

cell, exalbuminous.—Species about 15, distributed over the warmer parts of the world.

T. terrestris, *Linn. Sp. Pl. 387; D. & G. Bomb. Fl. 45; F. B. I., i. 423; Watt E. D.* T. lanuginosa, *Linn.; W & A. Prod. 145; Royle Ill. 153.*

A prostrate annual or biennial, clothed with silky hairs; branches 1-2 ft. *Leaflets* 5-7 pairs, subequal, mucronate. *Flowers* ½-¾ in. across, on peduncles shorter than the leaves. *Cocci* with 2 long and 2 short spines, glabrous or hairy, mucronate. *Stigmatic lobes* longer than the diameter of the style.

Plentiful within the area, especially in sandy and rocky places. DISTRIB.: Throughout India and in Ceylon, up to 11,000 ft. in W. Tibet; widely distributed over the warmer regions of the world. This plant, and especially the fruit, is much used medicinally by Hindus. The young parts are eaten as a potherb, and the flour prepared by grinding the prickly fruits is largely consumed by many people during times of famine.

2. FAGONIA, Linn.; Fl. Brit. Ind. i, 425.

Branching undershrubs. *Leaves* opposite, 1-3-foliolate, entire mucronate; *stipules* usually spiny. *Peduncle* solitary from between the stipules. *Sepals* 5, deciduous, imbricate. *Disk* short. *Stamens* 10, inserted on the disk; *filaments* filiform, naked; *anthers* oblong. *Ovary* sessile, 5-cornered, 5-celled, tapering into a subulate style; *stigma* simple; *ovules* 2, collateral at the base of each cell, pendulous from ascending funicles. *Fruit* of five 1-seeded cocci which dehisce along the ventral suture and separate from a horny endocarp. *Seeds* erect, compressed, broadly oblong, testa mucilaginous, albumen horny.—Species about 18, inhabiting the Mediterranean region, S. Africa and Trop. America.

F. cretica, *Linn. Sp. Pl. 386; var* arabica, *T. Anders.* F. arabica, *Linn.; F. B. I. i, 425; Watt E. D.* F. mysorensis, *Roth; W. & A. Prod. 145; D. & G. Bomb. Fl. 45; Royle III. 153.* Vern. *Jowasa.*

A small green spiny undershrub with erect glandular branches. *Leaves* 1-3-foliolate; leaflets elliptic or linear, acute; *petiole* often leaflike; stipular spines exceeding the leaflets. *Flowers* small, pale rose-coloured. *Sepals* half as long as the petals. *Capsule* pubescent, about as long as the recurved peduncle. *Seeds* punctulate.

In rocky places near Agra and Delhi, and in the Jumna and Chambal ravines about Etawah. DISTRIB.: Punjab, Sindh and S. India and westward to Egypt. The plant is valued medicinally. In typical *F. cretica* the spines are very much shorter, and the sepals are ½ the length of the purple petals. Another variety, *F. Bruguieri*, with ovate fleshy leaflets, is found in the Punjab.

3. PEGANUM, Linn. ; Fl. Brit. Ind. i, 486.

Branching glabrous or pubescent perennial-rooted herbs. *Leaves* alternate, entire or multifid, not glandular ; *stipules* setaceous. *Flowers* solitary, in subterminal leaf-opposed peduncles, white. *Sepals* 4-5, persistent. *Petals* 4-5, subequal, imbricate. *Stamens* 12-15, inserted at the base of the disk, some antherless, *filaments* dilated below ; *anthers* linear. *Ovary* globose, deeply 2-3-lobed ; *styles* basal, twisted, 2-3-keeled above, the keels stigmatose ; *ovules* many in each cell, inserted in the inner angle. *Fruit* globose, 3-4-celled, dry and 3-valved or fleshy and indehiscent, cells many-seeded. *Seeds* angled ; testa spongy, rough, albumen fleshy—Species 3 or 4, inhabiting the Mediterranean area, W. Asia and Mexico.

P. Harmala, *Linn. Sp. Pl. 444 ; W. & A. Prod. 146 ; Royle Ill. 156 ; D. & G. Bomb. Fl. 45 ; F. B. I. i, 486 ; Watt E. D. 124.* Vern. *Harmal.*

A bush-like glabrous herb, 1-3 ft. high. Stem dichotomously and corymbosely branched. *Leaves* 2-3 in., multifid ; segments linear, acute. *Flowers* ½-¾ in. across, solitary in the axils of the branches, sessile or stalked, white. *Calyx-lobes* linear, exceeding the corolla, persistent. *Capsule* globose, depressd at the apex.

Common in the drier portions of the area. DISTRIB. : Kashmir, Sindh, Punjab plain, W. Deccan ; extending to Arabia, N. Africa and S. Europe. The seeds yield a red dye, and various part of the plant are used medicinally.

XXVII.—GERANIACEÆ.

HERBS or undershrubs, rarely trees. *Leaves* opposite or alternate, usually 2-stipulate. *Inflorescence* various. *Flowers* usually showy, hermaphrodite, regular or irregular. *Sepals* 5, rarely 4 or 2, free or united to the middle, usually imbricate, the posterior one sometimes spurred. *Petals* usually 5, often apparently 3, rarely 0, free or connate, equal or unequal, imbricate. *Disk* with 5 glands alternating with the petals, or without glands. *Stamens* 5-15 ; filaments often dilated below or connate into a ring. *Ovary* usually of 3-5 carpels united with the axis which sometimes lengthens into a beak ; *styles* free or united ; *ovules* 1-2 (rarely many) in each cell. *Fruit* usually a 3-5-lobed capsule, loculicidal or septicidal ; lobes 1-seeded, often separating from the axis when ripe. *Seeds* with or without an aril, albumen scanty or 0.—Species about 800, found chiefly in temperate climates.

Flowers regular.

Petals imbricate, alternating with the glands of the disk; fruit of 5 cocci.

Stamens 15, connate below . . . . . 1. MONSONIA.

Stamens 10, distinct . . . . . 2. GERANIUM.

Petals contorted, glands 0.

Fruit a capsule—Herbs.

Leaves 3-foliolate . . . . . 3. OXALIS.

Leaves pinnate . . . . . 4. BIOPHYTUM.

Fruit a berry—Trees . . . . . 5. AVERRHOA.

Flowers irregular . . . . . 6. IMPATIENS.

1. MONSONIA, Linn.; Fl. Brit. Ind. i, 427.

Herbs or undershrubs. *Leaves* opposite or alternate, stipulate. *Peduncles* axillary, bracteate. *Flowers* solitary or in umbels. *Sepals* and *petals* 5, imbricate, the latter alternating with 5 small glands. *Stamens* 15, all bearing anthers, connate below, 5 of them larger and alternate with the petals. *Ovary* 5-lobed and 5-celled, beaked; beak ending in the style and bearing 5 linear branches inwardly stigmatose; *ovules* 2, superposed in each cell. *Capsule* with a very long beak of five 1-seeded carpels. *Carpels* with 5 elastic tails which are bearded on the inner side and separate from the beak. *Seeds* exalbuminous.—Species 12, nearly all of which are found in Africa.

M. senegalensis, *Guill. & Perr. Fl. Seneg. Tent. i, 131; D. & G. Bomb. Fl. 41; F. B. I. i, 427.* Erodium chumbalense, *Murno in text Wight Ic. 1074.*

A viscid diffuse annual or undershrub. *Leaves* ¾-1½ in., long-stalked ovate or cordate, obtuse or mucronate, repand-toothed, smooth above, hairy beneath; *stipules* subulate. *Peduncles* long, sharply deflexed at the bracteoles, rarely 2-flowered. *Sepals* obovate, awned, densely pubescent. *Petals* violet or pink, scarcely exceeding the sepals. *Filaments* ciliate. *Carpels* stipitate, wrinkled near the top, roughly hairy; beak 3 in. long.

Chambal ravines near Agra (Munro), Merwára (A.E. Lowrie). DISTRIB.: Sindh, Deccan, Baluchistan; also in Arabia, and westward to Senegambia and Namaqualand.

2. GERANIUM, Linn.; Fl. Brit. Ind. i. 428.

Herbs or undershrubs. *Leaves* opposite or alternate, stipulate *Peduncles* axillary, bracteate, 1-2-flowered, or pedicels umbelled

Flowers regular. *Sepals* and *petals* imbricate, the latter alternating with 5 glands. *Stamens* 10, usually all fertile, free or connate at the base. *Ovary* 5-lobed, 5-celled, beaked; *styles* 5, stigmatose longitudinally; *ovules* superposed. *Capsule* 5-lobed, 5-celled, cells 1-seeded. *Carpels* usually dehiscent ventrally, often separating septifragally from the axis, their beaks elastically coiling upwards. *Seeds* with scanty albumen or 0.—Upwards of 160 species have been published, and nearly all are found in the Northern Hemisphere.

The allied genus, *Pelargonium*, largely represented in S. Africa, contains the numerous so-called 'garden geraniums,' many of which are hybrids. Various kinds of *Tropæolum*, another genus belonging to this family, are much grown in Indian gardens under the popular name of 'nasturtium', which must not be confounded with the genus *Nasturtium*, represented by watercress,' and belonging to the *Cruciferæ*.

G. ocellatum, *Jacquem. Voy. Bot. 33, t. 38; F. B. I, i. 433; Watt E. D.* G. bicolor *and* G. choorense *Royle Ill. 149, 150.*

A much-branched prostrate annual, hoary-pubescent or hairy and glandular. *Leaves* ½-2 in. in diam., orbicular, 5-7-lobed; lobes cuneate, 3-5-fid. *Peduncles* sometimes clustered, or solitary and 1-flowered. *Flowers* ¾ in. across, rose-coloured with a dark purple eye. *Sepals* rigid after flowering. *Petals* broadly obcordate, larger than the sepals. *Carpels* corrugated. *Seeds* smooth.

Dehra Dun and Siwalik range. DISTRIB.: Punjab hills, and on the W. Himalaya up to 6,000ft., from Kashmir to E. Nepal, also on Parasnath in Bengal. The plant possesses medicinal properties.

3. OXALIS, Linn.; Fl. Brit. Ind. i, 435.

Herbs with acid juice, rarely shrubs. *Leaves* usually 3-foliolate, with or without stipules. *Flowers* on axillary 1- or more-flowered peduncles, regular. *Sepals* 5, imbricate. *Petals* 5, hypogynous, contorted. *Glands* of disk 0. *Stamens* 10, free or united at the base, all anther-bearing. *Ovary* lobed, 5-celled; *styles* 5, distinct; *stigma* terminal; *ovules* 1 or more in each cell. *Capsule* loculicidal, valves persistent to the axis. *Seeds* with an outer fleshy coat which bursts elastically, testa crustaceous, albumen fleshy.—Species about 220, tropical and temperate.

O. corniculata, *Linn, Sp. Pl. 435; Roxb. Fl. Ind. ii, 457; W. & A. Prod. 142; Royle Ill. 152; F. B. I. i, 436; Watt E. D.* Vern. *Amrul chalmori*,—Indian Sorrel.

A perennial appressed-pubescent herb with long slender creeping or subterranean stems, rooting at the nodes; roots often tuberous. *Leaves* on long petioles, 3-foliolate, leaflets obcordate; stipules adnate to the

petiole. *Flowers* ¾ in. across, subumbellate; *bracts* setaceous. *Sepals* obtuse. *Petals* obcordate, yellow. Fruiting *pedicels* deflexed. *Capsule* subcylindric; cells many-seeded. *Seeds* transversely ribbed.

Common within the area, especially in cultivated ground. DISTRIB.: Throughout India and in Ceylon, ascending to 7,000 ft. on the Himalaya; found also in all tropical and temperate climates. The leaves are used medicinally, and also as a potherb by the poorer classes.

4. BIOPHYTUM, DC. Fl. Brit. Ind. i, 436.

Herbs, usually annual, with simple or branched stems. *Leaves* abruptly pinnate, fascicled or almost whorled at the top of the stem; leaflets opposite, oblique; petiole swollen at the base. *Peduncles* terminal; *pedicels* umbelled. *Flowers* small, usually yellow, *Sepals* 5, lanceolate, acuminate. *Petals* 5. *Stamens* 10, *filaments* free, 5 outer smaller. *Styles* 5. *Capsule* splitting loculicidally into 5 spreading valves. *Seeds* as in *Oxalis*.—Species about 20, inhabiting Tropical Asia, Africa, and America.

The flowers are dimorphic as regards the relative length of the stamens and styles. The leaves of some of the species are sensitive, the leaflets also closing downwards.

Sepals usually much longer than the capsule	1. *B. sensitivum.*
Sepals small, hardly exceeding the capsule	2. *B. Reinwardtii.*

1. B. sensitivum, *DC. Prod. i, 690; Roxb. Fl. Ind. ii, 457; W. & A. Prod. 162; Royle Ill. 152; D. & G. Bomb. Fl. 42; F. B. I. i, 436.*

Stems hispidly pubescent. *Leaves* 1½-5in.; leaflets 6-15 pairs, variable in size. *Peduncles* very variable, ½-5in., hispid, sometimes swollen at the tip; *bracts* rigid, setaceous. *Flowers* shortly pedicelled, yellow. *Sepals* subulate, rigid, glandular and hispid, usually much exceeding the capsule. *Petals* about twice as long as the sepals. *Capsule* elliptic, shining. *Seeds* minute, with obliquely transverse tuberculed ridges.

Common within the area. DISTRIB.: Throughout the hotter parts of India and in Ceylon, ascending to 6,000 ft. on the Himalaya; also in Tropical Africa and America.

2. B. Reinwardtii, *Klotzsch in Peters, Reise Mossamb. Bot. 85; F. B. I. i, 437.*

Leaflets 10-20 pairs, oblong, tip rounded, equal at the base. *Pedicels* equalling or exceeding the small flowers. *Sepals* hardly exceeding the capsule.

Dehra Dun (Vicary). DISTRIB.: Hotter parts of India; also in China and Java. Best distinguished from *B. sensitivum* by its graceful habit, slender peduncles, smaller flowers, and by the capsule not being much overtopped by the sepals.

5. AVERRHOA, Linn.; Fl. Brit. Ind. i, 439.

Trees with alternate imparipinnate leaves, without stipules. *Flowers* small, regular, in axillary panicled cymes, or emerging from the branches. *Sepals* 5, imbricate. *Petals* 5, contorted. *Glands* 0. *Stamens* 10, united at the base, all perfect or 5 without anthers. *Ovary* 5-lobed, 5-celled, not beaked; *styles* 5, distinct; *stigmas* capitate; *ovules* many in each cell. *Fruit* oblong, 5-lobed, indehiscent *Seeds* 2-5 in each cell, with or without an aril; albumen scanty, fleshy.—Species 3 or 4, two of which are cultivated in India and in other hot countries. Probably both of these latter are natives of the New World, whence they were very likely introduced into India by the Portuguese.

Leaflets 2-5 pairs, fruit acutely angled, seeds arillate	1. *A. Carambola*.
Leaflets 5-12 pairs, fruit obtusely angled, seeds not arillate	2. *C. Bilimbi*.

1. A. Carambola, *Linn. Sp. Pl. 428; Roxb. Fl. Ind. ii, 450; W. & A. Prod. 141; Royle Ill. 152; Brand. For. Fl. 45; F. B. I. i, 439; Watt E. D.* Vern. *Khamrak.*

Largely cultivated all over the hotter parts of India for the sake of its fruit, which is usually very acid; there is, however, a sweet variety grown in Bengal. Various portions of the tree are used medicinally. It flowers during the hot and rainy seasons, and the fruit ripens in the cold season. The leaves are sensitive.

2. A. Bilimbi, *Linn. Sp. Pl. 428; Roxb. Fl. Ind. ii, 451; W. & A. Prod. 142; Royle Ill. 152; Brand. For. Fl. 46; F. B. I. i, 439; Watt E. D.* Vern. *Bilimbi.*

In gardens throughout the hotter parts of India, also naturalized as an escape. The reddish purple flowers appear during the hot season. The very acid fruit, which ripens during the rainy season, is pickled and is often used in curries, or preserved in sugar.

6. IMPATIENS, Linn.; Fl. Brit. Ind. i. 440.

This genus is distinguished from all the preceding ones by its irregular and resupinate flowers. It contains over 200 species, the majority of which are natives of India. They are distributed throughout the Himalaya, occurring most abundantly on the moist outer ranges. Many kinds are found also in the mountainous regions of S. India. Some of the species are gregarious, and form a marked feature of the undergrowth during the rainy season.

The only species possessing any claim to be specially mentioned as an inhabitant of the Gangetic Plain is *I. Balsamina* Linn. from which the numerous varieties of the ordinary 'Garden Balsam' have originated. In Dehra Dun, and in other parts of the Upper Gangetic area, it has become naturalized as an escape from cultivation, or self-sown from seeds washed down from the hills. Six varieties are mentioned in the *Fl. Brit. Ind.*, one of which, *var. rosea*, occurs plentifully as a wild plant on the lower slopes of the Western Himalaya. The seeds of this and of other species are eaten, and the oil which they contain is used as food, as well as for burning.

XXVIII.—RUTACEÆ.

TREES or shrubs (sometimes climbing), rarely herbs, abounding in pellucid glands filled with essential oil. *Leaves* opposite or alternate, simple or compound, exstipulate. *Flowers* in axillary or terminal cymes or panicles, never spiked, usually bisexual and regular (in the Indian species). *Calyx* of 4-5 small lobes. *Petals* 4-5, hypogynous (in the Indian genera), valvate or imbricate. *Stamens* usually definite (many in *Citrus* and *Ægle*); *filaments* usually free, hypogynous; *anthers* 2-celled, opening inwards. *Disk* within the stamens, crenate or lobed, sometimes large or elongated. *Ovary* of 4-5 free or connate carpels; *styles* as many, free or variously united; *stigmas* terminal, entire or lobed; *ovules* usually 2 in each cell. *Fruit* a capsule, berry or drupe, or of 1-4 capsular cocci. *Seeds* usually solitary in the cells; albumen fleshy or 0. A large and important family widely distributed over the warmer parts of the world and abundantly represented in S. Africa and Australia. Some of the species are extremely bitter, others contain a large amount of aromatic oil found in the pellucid glands which are so characteristic of this family.

Flowers 1-sexual or polygamous, seeds albuminous.
- Fruit of distinct dehiscent cocci. A prickly tree . . . . . 1. ZANTHOXYLUM.
- Fruit syncarpous, indehiscent.
  - Leaves 3-foliolate, stamens 5. A prickly scandent shrub . . . . . 2. TODDALIA.
  - Leaves 1-foliolate, stamens 8. A small unarmed tree . . . . . 3. ACRONYCHIA.

Flowers 2-sexual (in *Feronia* often polygamous), seeds without albumen.
- Unarmed, leaves pinnate.
  - Ovules solitary in each cell . . . . . 4. GLYCOSMIS.

Ovules 2 in each cell (solitary in *Murraya Kœnigii*).	
Style long	5. MURRAYA.
Style short	6. CLAUSENA.
Armed with axillary spines.	
One ovule in each cell, leaf-rachises winged	7. LIMONIA.
Ovules numerous in each cell, leaf-rachises not winged.	
Pericarp leathery	8. CITRUS.
Pericarp woody.	
Leaves imparipinnate, stamens 10-12 .	9. FERONIA.
Leaves 3-foliolate, stamens many . .	10. ÆGLE.

ZANTHOXYLUM, Linn.; Fl. Brit. Ind. i, 492.

Shrubs or trees, often armed with stout prickles. *Leaves* alternate 3-foliolate or unequally pinnate. *Flowers* small, in axillary or terminal peduncled cymes, often unisexual. *Calyx* 3-8-fid, rarely 0. *Petals* 3-5 or 0, imbricate or induplicate-valvate. *Disk* small or obscure. *Stamens* 3-8, or reduced to scales in the fem. flower. *Ovary* rudimentary in the male flower, in the fem. flower of 1-5 oblique 1-celled carpels; *styles* sublateral, free or connate above; *stigma* capitate; *ovules* 2 in each cell. *Fruit* of 1-5 globose coriaceous or fleshy 1-seeded ventrally dehiscing carpels. *Seeds* with bony or crustaceous, blue or black, shining testa; albumen fleshy.—Species all tropical or subtropical.

Z. alatum, *Roxb. Hort. Beng. 72; Fl. Ind. iii, 768; F. B. I. i., 493; Brand. For. Fl. 47; Watt E. D.* Z. hostile, *Wall (in part)*: *Royle Ill. 157.* Vern. *Tejbal.*

A shrub or small tree, all parts pungently aromatic. Prickles on trunk and branches often vertically flat, the older with a corky base. *Leaves* unequally pinnate; *leaflets* 2-6 pairs, lanceolate, glabrous beneath; petiole and rachis usually winged, the petiole with 2 stipular prickles at the base. *Flowers* small, yellow, in lax panicles, 2-6 in. long, glabrous or pubescent. *Calyx* with 6-8 acute segments. *Petals* 0. *Stamens* 6-8. Ripe *carpels* 1-3, reniform or ovoid, of the size of a small pea when fresh reddish, tubercled.

Dehra Dun. DISTRIB.: Hot valleys of the outer Himalaya from the Indus to Bhutan, also on the Khasia Hills. Flowers April to June, and the fruit ripens August to October. The pungent fruit, resembling that of *coriander*, is used medicinally, and as a condiment, also when crushed for purifying water. Walking sticks are manufactured from the branches, and tooth-sticks from the twigs. The bark is used for intoxicating fish.

2. TODDALIA, Juss.; Fl. Brit. Ind. i, 497.

Usually subscandent or sarmentose prickly shrubs. *Leaves* alternate, 1-3-foliolate; *leaflets* sessile. *Flowers* small, in axillary or terminal cymes, unisexual. *Calyx* 2-5-lobed. *Petals* 2-5. *Stamens* 2, 4 or 5 (or 8 with the alternate ones imperfect), inserted at the base of the conspicuous disk. *Ovary* 2-7-(rarely 1-) celled; *style* short or 0; *stigma* capitate; *ovules* 2 in each cell. *Fruit* subglobose or lobed, 2-7-celled; cells usually 1-seeded. *Seeds* angled, reniform, testa coriaceous, albumen fleshy.—Natives of tropical and subtropical parts of Asia and Africa, also in Australia.

T. aculeata, *Pers. Syn. i, 249; W. & A. Prod. 149; Royle Ill. 158; D. & G. Bomb. Fl. 44; Brand. For. Fl. 46; F. B. I. i, 497. Watt E. D.* Scopolia aculeata, *Sm.; Roxb. Fl. Ind. i, 616.* Limonia oligandra *Dalz.; D. & G. Bomb. Fl. 28.* Vern. *Kanj, dahan* and *lahan* (Rájputána).

A rambling sarmentose usually prickly shrub. *Leaflets* sessile, 1-3 in. long, elliptic, obovate, oblong or lanceolate, crenulate, acute, obtuse or notched at the apex. *Cymes* axillary, longer or shorter than the leaves. *Flowers* small, cream-coloured. *Petals* 5, imbricate. *Stamens* exceeding the petals. *Ovary* usually 5-celled; *style* short; *stigma* 5-lobed; *ovules* 2, superposed in each cell. *Berry* 5-celled, 5-grooved, size of large pea, orange-coloured. *Seeds* solitary in each cell.

Shady ravines and swampy places in Dehra Dun, Merwára. DISTRIB.: Subtrop. Himalaya from Garhwál eastward to Bhutan, ascending to 5,000 ft.; Khasia Hills and south to Ceylon; also in Sumatra, Java, China and the Philippines. Flowers February to April, fruit ripens July to September. The whole plant is pungently aromatic, and is highly valued for its medicinal properties, which resemble those of *Berberis*. The root-bark yields a yellow dye, and the ripe pungent berries are sometimes pickled.

3. ACRONYCHIA, Forst.; Fl. Brit. Ind. i, 498.

Trees. *Leaves* opposite or alternate. 1- rarely 3- foliolate; *leaflets* quite entire. *Flowers* peduncled, in axillary and terminal corymbs, polygamous. *Calyx* 4-lobed, lobes imbricate. *Petals* 4, spreading, revolute, valvate. *Stamens* 8, inserted under a thick 8-angled tomentose disk; *filaments* subulate, the alternate longer; *ovary* inserted in the hollow tip of the disk, tomentose, 4-celled; *style* terminal; *stigma* 4-grooved; *ovules* 2 in each cell, superposed. *Fruit* a 4-celled drupe (in the Indian species). *Seeds* often exserted and pendulous from a slender funicle, testa black, albumen copious.—Species about 17, inhabiting tropical Asia and Australia.

A. laurifolia, *Blume Cat. Gew. Buitens. 27, 63; F. B. I. i, 498.* Cyminosma pedunculata, *Roxb. Fl. Ind. ii, 239; W. & A. Prod. 147; D.*

& G. Bomb. Fl. Suppl. 17. Clausena simplicifolia, *Dalz.; D. & G. Bomb. Fl. 30.*

A small tree or shrub, glabrous, or with the young parts and inflorescence silkily hairy. *Leaves* 1-foliolate, variable; *leaflets* 2-6 in., elliptic, sub-obovate or oblong, obtuse or obtusely acuminate, membranous, entire, veined and reticulate on both surfaces. *Flowers* ¼-⅓ in. across, in slender long-peduncled corymbose cymes, yellowish-white, fragrant; *bracts* and *bracteoles* small. *Sepals* very small, rounded. *Petals* linear, villous inside. *Filaments* equalling the petals, bearded below. *Drupe* very variable in size from a pea to a small cherry.

Dehra Dun, in swamps. DISTRIB: Bengal, Sikkim, Khasia Hills, Assam, Burma, Malay Pen., S. India and Ceylon; also in Sumatra, Java and Cochin China. Flowers May to July. Dr. Trimen mentions that the bark is used in Ceylon as an external application to sores.

4. GLYCOSMIS, Correa; Fl. Brit. Ind. i, 499.

Unarmed shrubs or trees. *Leaves* 1-foliolate or imparipinnate; *leaflets* alternate. *Flowers* small, bisexual, in axillary rarely terminal panicles. *Calyx* 4-5-partite; segments broad, imbricate. *Petals* 4-5, imbricate. *Stamens* 8-10, free, inserted round a disk; *filaments* dilated; *anthers* small, often with a dorsal or apical gland. *Ovary* 2-5-celled; *style* very short, persistent; *stigma* simple; *ovules* solitary and pendulous in each cell. *Berry* small, 1-3-seeded. *Seeds* oblong, testa membranous.—Species about 6, Asiatic and Australian.

G. pentaphylla, *Correa in Ann. Mus. Par. vi, 336; W & A. Prod. 93; Royle Ill. 129; D. & G. Bomb. Fl. 29; Brand. For. Fl. 49; F. B. I. i. 500: Watt E. D. G.* chylocarpa, *W. & A. Prod. 93.* Limonia pentaphulla, *Retz.: Roxb. Fl. Ind. ii, 381; Royle Ill. 130.* L. arborea, *Roxb.; Fl. Ind. lc.* Vern. *Ban-nimbu.*

A small evergreen glabrous shrub. *Leaves* very variable, usually 3-5-foliolate, rarely 1-fol. *Leaflets* 4-9 in. long, ovate-lanceolate ovate or obovate, obtuse acute or acuminate, penninerved, entire or obscurely crenulate. *Flowers* small, white, fragrant, in erect terminal or lateral pubescent panicles. *Ovary* glabrous, covered with projecting glands, usually 5-celled; *style* very short and stout. *Berry* ½ in. across, subglobose or somewhat compressed, white, pink or blue.

Common in many parts of the area, especially in Dehra Dun, and along the base of the Himalaya eastwards, often forming a thick undergrowth. DISTRIB.: Trop. and subtrop. Himalaya from the Sutlej to Sikkim, ascending to 7,000ft., Assam, Orissa, Malay Pen., S. India, and Ceylon; extending to China, the Philippines, Borneo, and Australia. It flowers and fruits during the greater part of the year. The twigs are used as tooth-sticks, and the fruit is eaten.

5. MURRAYA. Linn.; Fl. Brit. Ind. i. 502.

Unarmed shrubs or small trees. *Leaves* pinnate; *leaflets* alternate, petioled. *Flowers* usually in terminal cymes, bisexual. *Calyx* 5-fid. or -partite. *Petals* 5, free, imbricate or valvate. *Stamens* 10, inserted round an elongated disk; alternate filaments shorter. *Ovary* 2-5-celled, narrowed into a long deciduous style; *stigma* capitate; *ovules* solitary, or 2 superimposed or collateral in each cell. *Berry* 1-2-celled, oblong or ovoid, 1-2-seeded. Species about 5, inhabiting Tropical Asia.

Evergreen; leaflets 3-9, glabrous . . .	1. *M. exotica.*
Deciduous; leaflets 9-25, pubescent . . .	2. *M. Kœnigii.*

1. M. exotica, *Linn. Mant. ii, 563; Roxb. Fl. Ind. ii, 374; Royle Ill. 129; Brand. For. Fl. 48; F. B. I. i, 502; Watt E. D.* Vern. *Machula, bilgar* (Dehra Dun), *girgitli* (Oudh.)

An evergreen shrub or small tree with ash-coloured bark, glabrous or the young parts pubescent. *Leaves* 4-5 in. long. *Leaflets* 3-7, 1-3 in. long, shortly stalked, ovate obovate or rhomboid, obtuse or obtusely acuminate, often notched at the tip, entire, usually very oblique at the base, thinly coriaceous, dark green and shining above. *Flowers* few or many, in short terminal and axillary corymbs, ½ in. across, pure white, very fragrant. *Sepals* minute, acute. *Petals* oblong-lanceolate, spreading above. *Ovary* 2-celled; *ovules* 2 in each cell; *style* filiform. *Berry* ½-¾ in. long, ovoid, pointed, rugose, red or deep orange when ripe.

Dehra Dun and Siwalik range, in shady ravines; also in the forests of Rohilkhand and N. Oudh. DISTRIB.: Outer Himalaya, up to 4,500 ft., from Garhwal to Assam, Chittagong, Behar, Burma, S. India, Ceylon; extending to China, Australia and the Pacific Islands. Flowers May to September, and the fruit ripens during the cold season. The heavy close-grained wood has been used as a substitute for box-wood. The fragrant bark is often used in Burma instead of sandalwood, and tooth-sticks are prepared from the twigs. It is largely grown in gardens as an ornamental shrub.

2. M. Kœnigii. *Spreng. Syst. ii, 315; Brand. For. Fl. 48; F. B. I. i, 503; Watt E. D.* Bergera Kœnigii *Linn.; Roxb. Fl. Ind. ii 375; W. & A. Prod. 94; Royle Ill. 129; D. & G. Bomb. Fl. 29.* Vern. *Gandhela, káthnim, harri* (Oudh), *gundi* (Bijnor).

A deciduous strong-scented pubescent shrub or small tree with brownish bark. *Leaves* 6-12 in. long; *petiole* slender, terete. *Leaflets* 9-25, 1-2 in. long, shortly stalked, ovate-lanceolate, with an oblique base, obtusely acuminate and notched at the tip, entire or obscurely crenulate. *Flowers* many, ½-¾ in. long, in terminal corymbose panicles, white. *Calyx* segments short, triangular. *Petals* oblong, much longer than the calyx. *Ovary* 2-

celled, with usually only 1 ovule in each cell; *style* short. *Berry* ovoid, ⅓ in. in diam., rugose, black when ripe. *Seeds* imbedded in mucilage.

Abundant and often gregarious in the northern portions of the area. DISTRIB.: Outer Himalaya from the Punjab to Sikkim, ascending to 5,000 ft.; also in Bengal, Burma, S. India and Ceylon. Flowers during the whole of the hot weather. The root, bark and leaves are medicinal and the leaves are much used for flavouring curries.

6. CLAUSENA, Burm.; Fl. Brit. Ind. i. 503.

Unarmed shrubs or trees. *Leaves* imparipinnate. *Leaflets* membranous. *Flowers* small, in terminal or axillary panicles. *Calyx* 4-5-lobed or -partite. *Petals* 4-5, free, slightly imbricate. *Stamens* 10, inserted round an elongated disk, the alternate ones shorter; *filaments* usually dilated below. *Ovary* on a raised torus, 2-5-celled; *style* short, deciduous; *stigma* obtuse, entire or 2-5-lobed; *ovules* 2 in each cell. *Berry* small, 2-5-celled. *Seeds* oblong.—Species about 14, inhabiting Tropical Asia, Africa and Australia.

C. Wampi, Oliv., a small tree, probably introduced from China, is cultivated in gardens for its fruit.

C. pentaphylla, *DC. Prod. i, 538; Brandis For. Fl. 49; F. B. I. i, 503; Watt E. D.* Amyris pentaphylla, *Roxb. Fl. Ind. ii, 247.* Vern. *Rattanjot, teyrur.*

A deciduous shrub; young parts silky-tomentose. *Leaves* large, 3-7-foliolate. *Leaflets* subopposite or alternate, 2-6 in. long, ovate or lanceolate, acuminate, entire, shortly stalked, softly tomentose beneath; main lateral nerves prominent. *Flowers* 4-merous, ¼ in. across, yellowish, in erect terminal downy panicles. *Sepals* triangular, acute. *Petals* oblong, concave. *Filaments* short, broad. *Berry* ⅓ in. in diam., ovoid, papillose, pale orange.

Abundant in the sál forests of Rohilkhand, Oudh, and Gorakhpur, also near Cawnpur (Hardwicke). DISTRIB.: Sub-Himalayan tract from Kumaon to Nepal. Flowers during April and May. The leaves are very aromatic.

7. LIMONIA, Linn.; Fl. Brit. Ind. i. 507.

Shrubs or small trees, often spiny. *Leaves* alternate, imparipinnate. *Leaflets* opposite or alternate; *petiole* winged. *Flowers* panicled, racemed or fascicled. *Calyx* equally 4-5-lobed or -partite. *Petals* 4-5, inbricate. *Stamens* 8-10, inserted around an annular or elevated disk; *filaments* subulate. *Ovary* oblong, 4-5-celled; *style* short, stout, deciduous; *ovules* 1-2 in each cell. *Berry* globose, 1-4-celled, 1-4-seeded. *Seeds* imbedded in mucilage. *Cotyledons* fleshy.—Species 4, natives of Tropical Asia.

L. crenulata, *Roxb. Cor. Pl. i, 60, t. 86; Fl. Ind. ii, 381.* L. acidissima, *Auct. plur. (not of Linn.); W. & A. Prod. 92; Royle Ill. 129; D. & G. Bomb. Fl. 29; Brand. For. Fl. 47; F. B. I. i, 507; Watt E. D.* Vern. *Beli.*

A glabrous shrub or small tree, armed with straight spines. *Bark* ash-coloured, rugose. *Branches* rigid, flexuous. *Leaves* alternate, imparipinnate; *petiole* and *rachis* jointed, the former narrowly the latter very broadly winged. *Leaflets* 5-9, 1-2 in. long, sessile, opposite, trapezoid-ovate, obtuse and notched at the tip, crenulate, cuneate at the base; joints of rachis obovate-oblong, crenulate. *Racemes* subumbellate, pubescent, often leafy. *Flowers* 4-merous, ½ in. across, white, fragrant. *Petals* elliptic or oblong, more than twice the length of the calyx. *Disk* annular or columnar. *Ovary* 4-celled; *style* short, thick; *ovules* 1 in each cell, pendulous. *Berry* globose, ½ in. in diam., 1-4 seeded, black, pulp very acid.

Dehra Dun and Siwalik range. DISTRIB.: W. Himalaya up to 4,000 ft., Bengal, Assam. W. and S. India; also in Yunan. Flowers in April and May, and the fruit ripens during the cold weather Various parts of the plant are used medicinally. The handsome, yellow, hard and close-grained wood has been recommended for the lathe. In Java the fruit is used instead of soap.

Dr. Trimen has pointed out in Journ. Bot. xxvii, 162, that Linnæus' *L. acidissima* is not this plant but *Feronia elephantum*, and that this name cannot be retained for either; also that as it is the species on which *Limonia*, L. was founded, that genus, strictly speaking, falls to the ground; moreover, as the present plant forms the genus *Hesperethusa*, Rœm., that name ought perhaps to be maintained in its stead.

8. CITRUS, Linn.; Fl. Brit. Ind. i. 514.

Evergreen shrubs or trees, usually spinous, *Leaves* alternate, 1-foliolate, coriaceous, more or less serrate, persistent; *petiole* often winged. *Flowers* axillary, solitary fascicled or in small cymes, white or pinkish, sweet-scented. *Calyx* cupular or urceolate, 3-5-fid. *Petals* 4-8, linear-oblong, thick, imbricate. *Stamens* 15-60, inserted round a large cupular or annular disk; *filaments* variously connate, compressed at the base; *anthers* oblong. *Ovary* many-celled; *style* stout, deciduous; *stigma* capitate; *ovules* 4-8, 2-seriate in each cell. *Berry* large, oblong or globose, fleshy, many-celled, septa membranous, cells few-seeded and filled with horizontal fusiform cells developed from the endocarp and distended with juice. *Seeds* horizontal or pendulous, containing sometimes two or more embryos.—Species about 7, two of which are Australian, and the remainder probably all originated in Tropical Asia.

Of the 4 species described in the Flora of British India, three will be specially mentioned here as representing all the different kinds of oranges,

limes, lemons and citrons found in cultivation within the area of the Upper Gangetic Plain.

For a clear and concise account of the botanical classification of "this genus the ' reader is referred to page 51 of Sir Dietrich Brandis' "Forest Flora of N. W. & C. India." Although 27 years have elapsed since the publication of that very useful work, very little additional information has been contributed towards ascertaining the true origin of some of the species and varieties of this difficult genus*. It is often not an easy matter to decide whether certain kinds of oranges and lemons, which are now growing apparently wild in many parts of India, are really indigenous, or merely represent remnants of some ancient cultivation, all other signs of which having become obliterated.

1. C. medica, *Linn. Sp. Pl. 782 ; Brand. For. Fl. 51 ; F. B. I. i, 514 ; Watt E. D.*

A shrub or small tree, flowering and fruiting at most seasons. Young shoots glabrous, purple. *Leaflet* 3-6 in, elliptic-ovate or ovate-lanceolate glabrous ; *petiole* naked or winged. *Flowers* white, or often tinged with pink, frequently 1-sexual. *Stamens* 20-40. *Fruit* globose, ovoid or oblong, often mammillate at the apex.

Valleys along the foot of the Himalaya, from Dehra Dun to Sikkim, ascending to 4,000 ft. ; also on the Khasia and Garo hills, in Chittagong, the W. Ghats, and on the Satpura range.

VAR. 1. medica proper ; *Brand. l. c. 52 ; F. B. I. l.c.; DC. L'Orig. Pl. Cult. 142 ; Watt E. D. C. Aurantium, var medica, W. & A. Prod. 93. C. medica Linn.; D & G. Bomb. Fl. Suppl. 13.* Vern. *Bijaura, turang.* (The Citron.) *Leaflet* oblong ; *petiole* short, margined or not. *Flowers* usually many. *Fruit* large, oblong or obovoid, mamilla obtuse, rind usually warted and thick. Cultivated in many parts of India.

VAR. 2. Limonum ; *Brand. l. c. ; F. B. I. i, 515 ; DC. L'Orig. Pl. Cult. 142 ; Watt E. D. C. Aurantium, var. Limonum, W. & A. l. c. C. Limonum, Risso ; D. & G. l. c. C. medica, Willd. in Roxb. Fl. Ind. iii, 392.* Vern. *Jámbirá, gulgul.* (The Lemon). *Leaflet* ovate ; *petiole* margined or winged. *Fruit* of medium size, ovoid, yellow, mammillate, rind thin ; pulp abundant, acid. Said to be found wild in Kumaon in the Kota Dun (Royle's *pahári kághzi*).

VAR. 3. acida ; *Brand. l.c. ; F. B. I. l.c. ; DC. L'Orig. Pl. Cult. 142 ; Watt E. D. C. acida, Roxb. Fl. Ind. iii, 390 (in part).* Vern. *Nimbu, kághzi nimbu.* (Sour Lime of India). *Leaflet* elliptic-oblong ; *petiole* more or less winged, many times shorter than the leaflet. *Racemes* short. *Flowers* small. *Petals* usually 4. *Fruit* usually small, globose or ovoid,

* The following important works relating to the genus *Citrus* have been published since the appearance of Brandis' Forest Flora :—Hook. f. in Fl. Brit. Ind. Vol. I, p. 514, in which Brandis' arrangement is closely followed ; Bentley and Trimen, Medicinal Plants (1880) ; DeCandolle, "L'Orig. Pl. Cult." (1883) ; Dr. Watts' "Dictionary of the Economic Products of India," Vol. II (1889) ; Bonavia, "Oranges and Lemons of India and Ceylon," with Atlas of Illustrations (1890). This latter work should be studied specially with reference to the origin of the numerous cultivated varities of these plants.

with a thick or thin rind; pulp pale, sharply acid. According to Watt this is the kind which is usually met with in a wild condition in the warm valleys of the Himalaya and in other localities mentioned above under *C. medica*, L. Several forms, varying in size and in the thickness of the rind, are in cultivation in various parts of India. The small oval juicy thin-skinned kind, called *Kághzi lime*, is much valued.

VAR. 4. Limetta; *Brand. l.c.*; *F. B. I. l. c.*; *DC. L'Orig. Pl. Cult. 142*; *Watt E. D. C. Aurantium, var. Limetta, W, & A. Prod. 98.* Vern. *Mitha nimbu.* (Sweet Lime.) *Leaflet* with a winged petiole. *Flowers* small, white. *Fruit* globose or ovoid, shortly mammillate; rind with concave vesicles. Cultivated in most parts of India, and indigenous to S. India according to Wight. Kurz in For. Fl. Burma, i, 197, reduces this to *C. nobilis*, Lour. The fruit is largely used medicinally. Watt agrees with Kurz in separating this plant from the sweet lemons (C. Lumia), and he also is of opinion that the majority of the forms described by Roxburgh under his *C. acida* should be included under *C. Limetta*, and placed quite apart from *C. medica*. On the other hand Bonavia in Journ. Linn. Soc. xxii, 213, maintains that all the cultivated true limes of India and Ceylon have been derived from *C. Hystrix* DC., (F. B. I. i, 515). The winged petiole is a very constant character of the limes, and in *C. Hystrix*, which he considers to be the original ancestor, the petioles are very largely developed.

VAR. 5. Lumia; *W. & A. Prod. 98. Brand. For. Fl. 53*; *F. B. I. l.c.*; *DC. L'Orig. Pl. Cult. 142*; *Watt E. D.* (The Sweet Lemon.) *Petioles* simply margined. *Flowers* tinged with red. *Fruit* bright yellow, ovoid-oblong, with a long curved mammilla; rind with convex vesicles; pulp sweet, without aroma.

2. **C. Aurantium**, *Linn. Sp. Pl. 783*; *Brand. For. Fl. 53*; *F. B. I. i. 515*; *DC. L'Orig. Pl. Cult. 144*; *Watt E. D.* (The Orange.) Usually a small tree, with the young shoots glabrous and greenish-white. *Leaflet* elliptic or ovate, obtuse acute or acuminate; *petiole* often broadly winged. *Flowers* pure white, 2-sexual. *Fruit* globose, generally oblate, not mammillate.

VAR. 1. Aurantium proper; *C. Aurantium, Linn.*; *Roxb. Fl. Ind. iii. 392*; *W. & A. Prod. 97*; *D. & G. Bomb. Fl. Suppl. 12.* Vern. *Nárangi, náringi.* (The Sweet Orange.) *Petiole* naked or winged. *Pulp* sweet, yellow, rarely red.

Bonavia recognizes four races of sweet oranges, *viz.*, (1) Santara, (2) Keonla, (3) Portugal and Malta, (4) Mandarin. The *Santara* kind is best distinguished by its loose skin. It is largely grown in the neighbourhood of Delhi, and also in the Nagpur district of the Central Provinces. The oranges grown in Sylhet, Bhutan, Nepal and Garhwal belong also to this class. These latter and the Nagpur oranges have a much thinner rind than that of the Delhi kind. An orange belonging to this class has been reported as apparently wild in the hot valleys at the foot of the Himalaya. The *Keonla*, or ordinary *naringi* of Upper India, has a rough dark-coloured clinging rind. It can stand a greater amount of heat than the *Santara*, and is more generally diffused over India; the pulp is not nearly so sweet. Bonavia alludes to a form of *Keonla* called *Kokni*, which is

cultivated at Saharanpur and Delhi. The reddish rind is oily and strongly aromatic, and the leaf has the characteristic scent of that of the *Keonla*. The *Portugal* or *Malta* race includes the well-known 'blood-orange,' which was introduced from Malta in 1852-56 by Colonel Clarke, and grown at Gujranwala in the Punjab, where it still retains its excellent character. This orange was also introduced at Lucknow by Dr. Bonavia a few years later. The true *Mandarin* orange is a native of China and Cochin China. It is cultivated in Ceylon, but is not found in Upper India, the climate being too hot and dry. It is a very small flat dark-coloured orange with a thin skin and shining as if varnished. It has also a very peculiar aroma. A small round dark-coloured fruit is grown in many gardens in Northern India under the name of *Mandarin*. It has probably originated from some form of *Keonla*.

VAR. 2. Bigaradia; *Brand. For. Fl. 53; F. B. I. i., 515; DC. l.c. 145, Watt E. D. C. vulgaris, Risso; W. & A. Prod. 97.* (Bitter or Seville Orange). *Petiole* usually winged. *Flowers* larger and more strongly scented than those of the sweet orange *Rind* aromatic and very bitter; pulp sour. Not much cultivated in India. It is probably a native of Cochin China, though found apparently wild on the Nilgiris.

3. **C. decumana**, *Murr. Syst. ed. xiii, 508; Roxb. Fl. Ind. iii, 393; W. & A. Prod. 97; Brand. For. Fl. 55; F. B. I. i, 516; DC. L'Orig. Pl. Cult. 140; Watt E. D.* Vern. *Chakotra, batavi nebu.* (Pumelo or Shaddock.)

A tree with the young shoots usually more or less pubescent. *Leaflet* large, ovate-oblong, frequently emarginate, usually downy beneath: *petiole* broadly winged. *Flowers* large, white. *Stamens* 16-44. *Fruit* often very large, pale, globose or pear-shaped; rind thick; pulp yellow pink or crimson, sweet or acrid, vesicles distinct.

The *pumelo* is largely cultivated in India and in most tropical countries. It is considered to be a native of the Malayan and Polynesian Islands. Dr. Bonavia, who has for many years made a special study of the oranges and lemons of India, hazards the opinion that the *pumelo* may have been developed from the Malta or Portugal orange, or that both may have sprung from a common ancester. He gives instances of the development of giant forms of various kinds of oranges, and remarks that the *pumelo* proper and the Malta orange are the only kinds of *Citrus* which are known to present varieties with red or blood colour in their pulp.

9. FERONIA, Correa; Fl. Brit. Ind. i. 516.

A spinous tree. *Leaves* alternate, imparipinnate; *leaflets* opposite, subsessile, quite entire; *petiole* winged or not. *Flowers* in terminal or lateral loose panicles or racemes, polygamous. *Calyx* small, flat, 5-toothed, deciduous. *Petals* 5, rarely 4-6, spreading, imbricate. *Stamens* 10-12, a few sometimes imperfect, inserted round a short disk; *filaments* dilated, sides and front villous, tip subulate; *anthers* linear-oblong. *Ovary* oblong, 5-6-celled, at length 1-celled; *style* 0; *stigma* oblong, fusiform, deciduous; *ovules* many, crowded in

many series upon 5-6 parietal placentas. *Fruit* large, globose, with a rough woody rind, 1-celled, many-seeded. *Seeds* buried in pulp, oblong, compressed.—A single species.

F. elephantum, *Correa in Trans. Linn. Soc. v, 225 ; Roxb. Cor. Pl. t. 141 ; Fl. Ind. ii, 411 ; W. & A. Prod. 96 ; Royle Ill. 129 ; D. & G. Bomb. Fl. 30 ; Brand. For. Fl. 56 ; F. B. I. i, 516. Watt E. D* Limonia acidissima, *L* (*see page 140*). Vern. *Bilin, Kat-bel* (Elephant or Wood-apple).

A small deciduous glabrous tree, armed with strong straight axillary thorns. *Bark* dark grey or nearly black, wrinkled, and with longitudinal shallow furrows. *Leaves* smelling of aniseed ; *leaflets* 5-7, cuneate or obovate, tip crenate. *Flowers* ½ in. across, pale-green stained with red. *Anthers* dark red, male and fem. flowers often in the same panicle. *Peduncle* and *pedicels* pubescent. *Fruit* about the size of a tennis ball.

Siwalik range, and forests at the base of the Himalaya in Rohilkhand and N. Oudh, often cultivated. DISTRIB. : Cultivated in many parts of India, and occasionally found wild : also in Java. Flowers Feb.-May ; the fruit ripens in October, and remains for a long time on the tree. The bark yields a valuable gum resembling gum-arabic. The pulp of the fruit is used medicinally, and also as a food adjunct. The hard dry shells of small fruits are used as snuff-boxes.

10. ÆGLE, Correa ; Fl. Brit. Ind. i, 516.

Spinous trees ; *leaves* alternate, 3-foliolate ; *leaflets* membranous, subcrenulate. *Flowers* large, white, in axillary panicles. *Calyx* small, 4-5-toothed, deciduous. *Petals* 4-5, spreading, imbricate. *Stamens* many, inserted round an inconspicuous disk ; *filaments* short, subulate ; *anthers* elongate. *Ovary* ovoid, axis broad, cells 8-20, peripheral ; *style* short ; *stigma* capitate, oblong or fusiform, deciduous ; *ovules* many, 2-seriate. *Fruit* large, globose ovoid or reniform, 8-15-celled ; cells many-seeded, rind woody. *Seeds* imbedded in aromatic pulp, oblong, compressed ; testa woolly and mucous.—Species 2 in Tropical Asia, and 1 in Trop. W. Africa.

Æ. Marmelos, *Correa in Trans. Linn. Soc. v, 223 ; Roxb. Fl. Ind. ii, 579 ; W. & A. Prod. 96 ; Royle Ill. 130 ; D. & G. Bomb. Fl. 31 ; Brand. For. Fl. 57 ; F. B. I. i, 516 ; Watt E. D.* Vern. Bel, bil. (Bael tree).

A small deciduous glabrous tree ; spines 1 in. long, strong, straight axillary. *Leaflets* usually 3, ovate-lanceolate, lateral sessile, terminal stalked. *Flowers* 1½ in. across, greenish-white, sweet-scented ; *pedicels* and *calyx* pubescent. *Filaments* sometimes fascicled. *Fruit* 2-7 in. in diam., globose oblong or pyriform. *Rind* grey or yellow. *Pulp* orange-coloured, sweet.

Common in the Dehra Dun and Saharanpur forests, and in other parts of the area, but often cultivated. DISTRIB. : Wild or cultivated throughout the greater part of India, ascending to 4,000 ft. on the outer

Himalaya. In cultivated trees the spines are often wanting. Flowers March to May, and the fruit becomes ripe about one year afterwards. The medicinal properties of the fruit of this tree are well known. The pulp of the ripe fruit is also largely eaten as food, or diluted with water it makes a refreshing drink. The root-bark and leaves are also used medicinally. A good gum exudes from the stems, and a dye is prepared from the rind of the fruit. The shells of the smaller fruits are largely used as snuff-boxes. Amongst Hindus the *Bael* is considered one of the most sacred of Indian trees, and on this account it is so often met with near temples.

XXIX.—SIMARUBEÆ.

TREES or shrubs, usually with bitter bark. *Leaves* alternate, often very large, usually pinnate; *stipules* 0 or deciduous. *Flowers* usually 1-sexual, regular, small. *Calyx* 3-5-lobed, valvate or imbricate. *Petals* 3-5, hypogynous, valvate or imbricate. *Stamens* usually as many or twice as many as the petals, inserted at the base of the disk; *filaments* free; *anthers* usually introrse, dehiscing longitudinally. *Ovary* free; 1-6-celled; *styles* 2-5; *stigmas* capitate; *ovules* usually solitary in each cell. *Fruit* drupaceous, capsular or samaroid, usually of 2-6 distinct 1-seeded carpels. *Seeds* albuminous.—Tropical and sub-tropical regions of both hemispheres.

A tall tree with pinnate leaves, fruit samaroid 1. AILANTHUS.

A small spiny tree with 2-foliolate leaves, fruit a drupe . . . . . 2. BALANITES.

1. AILANTHUS, Desf.; Fl. Brit. Ind. i. 518.

Lofty trees. *Leaves* very large, crowded near the ends of the branches, alternate, unequally pinnate. *Flowers* small, polygamous, bracteolate, in terminal or axillary panicles. *Calyx* 5-fid.; lobes equal, imbricate. *Petals* 5, valvate. *Disk* 10-lobed. *Stamens* 10 or 2-3 only in the hermaphrodite flowers. *Ovary* 2-5-partite; *styles* connate; *ovules* 1 in each cell. *Fruit* of 1-5 one-seeded samaras; wing large, membranous. *Seed* pendulous, sparingly albuminous.—Species about 7, inhabiting India, China, and Australia.

A. *glandulosa*, Desf., a species probably introduced from Japan, is sometimes met with as a planted tree within the area. It is hardy in Europe, and is often cultivated as an avenue tree. It is also grown for the rearing of different kinds of silkworms.

A. excelsa, *Roxb. Cor. Pl. i, t. 23; Fl. Ind. ii, 450; W. & A. Prod. 150; Royle Ill. 157; D. & G. Bomb. Fl. 46; Brand. For. Fl. 58; F. B. I. i. 518; Watt E. D.* Vern. *Arua.*

A tree, 60-80 ft. high. *Leaves* 1 foot or more, glandular-hairy; *leaflets* very many, on long stalks, ovate or falcate-lanceolate, unequal at the base, coarsely toothed, often lobed. *Flowers* yellowish, in large lax often much-branched panicles; *filaments* ½ the length of the anthers. *Samaras* 2 in. long, tapering to each end, twisted at the base, copper-red.

Planted at Saharanpur, Delhi, Agra, and Aligarh, possibly wild in Bundelkhand. DISTRIB.: Bengal, C. & S. India, wild or cultivated; also in Queensland (var. imberbifolia). Flowers in April and May. The aromatic and bitter bark and leaves are used medicinally, and the wood is used for light articles, such as drums, sword-sheaths and floats for fishing nets.

2. BALANITES. Delile; Fl. Brit. Ind. i. 522.

Spiny shrubs or trees. *Leaves* coriaceous, 2-foliolate, entire. *Flowers* green, in small axillary cymes. *Calyx*-segments 3, imbricate, deciduous. *Petals* 5, imbricate. *Disk* thick, conical, entire. *Ovary* entire, globose, 1-celled; *ovules* solitary, pendulous. *Fruit* a large fleshy oily 1-seeded drupe. *Seed* exalbuminous.

B. ægyptiaca. *Delile Fl. Egypte, 221, t. 28, f. 1, var.* Roxburghii. B. Roxburghii, *Planch.; Brand. For. Fl. 59; F. B. I. i, 522; Watt E. D.* B. ægyptiaca, *Wall.; Royle Ill. 154.* Ximenia ægyptiaca, *Roxb. Fl. Ind. ii, 253.* Vern. *Hingan, hingot.*

A small tree or scraggy shrub, with glabrous or puberulous branches ending in strong sharp thorns. *Leaves* of 2 elliptic or obovate puberulous entire coriaceous leaflets. *Flowers* in close cymes, small, white or greenish-white, fragrant. *Sepals* and *petals* ovate, velvety-pubescent. *Ovary* ovoid, short. *Drupe* about 2 in. long, 5-grooved; *rind* woody, of a light grey colour, inclosing a bitter offensive-smelling pulp. *Nut* hard, tuberculed, 1-seeded.

Not uncommon within the area, in open dry places where the soil is clayey. DISTRIB.: Sikkim, Bengal, C. & S. India, Burma; also in N. Africa, Arabia and Palestine. It differs from the type in having shorter petioles, and hairy petals, and the ovary does not lengthen out after flowering. Flowers in April and May. Various portions of the plant are used medicinally. The pulp of the fruit is used in Rajputana for cleaning silk, and the hard nuts are made into crackers, after removing the kernel and filling with gunpowder.

XXX.—OCHNACEÆ.

GLABROUS trees or shrubs. *Leaves* alternate, usually simple, coriaceous; *stipules* 2. *Flowers* bisexual, conspicuous, in panicles or umbels, rarely solitary, bracteate. *Sepals* 4-5, free, imbricate, persistent. *Petals* 5, rarely 4 or more than 5, hipogynous, imbricate.

Disk enlarged after flowering, or 0. *Stamens* 4, 5, 8, 10 or indefinite, inserted on the disk; *filaments* persistent; *anthers* basifixed, bursting longitudinally or by terminal pores. *Ovary* 3-10-celled; *style* simple or divided; *ovules* usually 1-2 in each cell, and ascending. *Fruit* of 3-10 sessile drupes, each 1-4-seeded, rarely a capsule. *Seeds* with or without albumen.—Tropical regions of both hemispheres, chiefly in S. America.

OCHNA, Linn.; Fl. Brit. Ind. i. 523.

Leaves simple, usually serrate. *Flowers* large, yellow, in bracteate panicles or umbels. *Sepals* 5, coloured, persistent. *Petals* 5-10. *Disk* thick and lobed. *Stamens* indefinite, shorter than the petals; *anthers* bursting longitudinally, deciduous. *Ovary* deeply 3-10-lobed, lobes 1-celled; *styles* entirely connate, or distinct at the apex; *ovules* solitary in each cell, axile. *Fruit* of 3-10 drupes, seated on the broad disk. *Seed* erect, albuminous.—Species 25-30, inhabiting Tropical Asia and Africa.

O. squarrosa, Linn. a handsome shrub with yellow flowers, indigenous in Bengal, Burma and S. India, is often met with in gardens in Upper India.

O. pumila, *Buch.-Ham. ex Don Prod. 224; Royle Ill. 165; Brand. For. Fl. 60; F. B. I. i, 524.* O. nana, *Buch.-Ham. D. & G. Bomb. Fl. 46.* O. collina, *Edgew. in Trans. Linn. Soc. XX, 43.*

An undershrub. *Leaves* large, broadly oblanceolate, narrowed below into a short petiole, acute or obtuse, sharply serrulate; *stipules* ¼-⅓ in. *Flowers* up to 1½ in. across, handsome, yellow, 3-6 in an umbel at the end of a common axillary peduncle, bracteate at the base. *Sepals* ovate, much shorter than the petals. *Filaments* shorter than the elongate anthers. *Styles* connate, or very slightly divided at the apex. *Drupes* finely reticulated.

Rohilkhand and N. Oudh to Gorakhpur, principally in sál forests, where it has become permanently dwarfed by the action of periodical jungle-fires. Its perennial underground stem throws up annually a number of sub-herbaceous stems about 2 ft. high, which bear leaves and flowers during the hot weather. DISTRIB.: Base of Himalaya from Kumaon to Sikkim; also in Pegu, in S. Konkan, and on the Satpura range.

XXXI.—BURSERACEÆ.

RESINOUS trees or shrubs. *Leaves* usually alternate, imparipinnate or 3-foliolate, rarely 1-fol., with or without stipules. *Flowers* in racemes or panicles, regular, small, 2-sexual or often polygamous.

Calyx free, 3-6-lobed, imbricate or valvate, often minute. *Petals* 3-6, rarely connate, imbricate or valvate. *Disk* annular or cupular, usually conspicuous. *Stamens* as many or twice as many as the petals, inserted at the base or margin of the disk, sometimes unequal; *filaments* usually free; *anthers* bursting longitudinally. *Ovary* free, generally 2-5-celled; *ovules* usually 2 in each cell, axile. *Fruit* a drupe, containing 2-5 pyrenes, rarely dehiscent. *Seeds* solitary, pendulous, albumen 0.—Tropical regions of both hemispheres.

Calyx small, open, fruit a trigonous valvately dehiscing capsule	1. BOSWELLIA.
Calyx urceolate, fruit a drupe.	
Flowers in racemes, calyx 5-fid . . .	2. GARUGA.
Flowers fascicled, calyx 4-toothed . .	3. COMMIPHORA.

1. BOSWELLIA, Roxb.; Fl. Brit. Ind. i, 527.

Trees abounding in resin. *Bark* often papery. *Leaves* alternate, exstipulate, imparipinnate, deciduous; *leaflets* opposite, sessile, usually serrate. *Flowers* small, white, 2-sexual, in axillary racemes or panicles. *Calyx* small, 5-toothed, persistent. *Petals* 5, distinct, narrowed at the base, imbricate. *Disk* annular, crenate. *Stamens* 10, inserted at the base of the disk. *Ovary* sessile, 3-celled; *style* short; *stigma* 3-lobed; *ovules* 2 in each cell, pendulous. *Drupe* 3-gonous, containing three 1-seeded pyrenes which finally separate. *Seeds* compressed, pendulous.—Species about 10, inhabiting India and N. Tropical Africa.

B. Carterii, Birdw. is the Frankincense- or Luban-tree of Arabia.

B. serrata, *Roxb. ex Colebr. in As. Res. ix, 379, t. 5; Royle Ill. 177; F.B. I. i, 528; Watt E. D.* B. thurifera, *Roxb. ex Flem. in As. Res. xi, 158; Fl. Ind. ii, 383; W. & A. Prod. 174; Brand. For. Fl. 61.* Vern. *Salai, salhe, gunj* (Bundelkhand).

A moderate-sized deciduous tree, with a spreading flat crown. Outer bark greenish or ash-coloured, peeling off in smooth thin flakes. *Leaves* crowded near the ends of the branches. *Leaflets* many, opposite or nearly opposite, inequilateral, coarsely crenate-serrate, very variable in size, shape and degree of pubescence. *Racemes* shorter than the leaves. *Calyx*-segments deltoid. *Disk* fleshy, red. *Drupe* ¼ in. long, trigonous, spliting into 3 valves.

Siwalik range and hills of Merwára and Bundelkhand, usually occupying the crests of the hills. DISTRIB.: Base of W. Himalaya west to the Sutlej, Rajputana, Chota Nagpur, C. and S. India. Flowers April and May; fruit ripens July-Aug. A transparent fragrant gum is yielded by this tree; it is burnt as incense, and also used medicinally.

VAR. *glabra.*—*B. glabra*, Roxb.; Fl. Ind. ii, 384; W. & A. Prod. 174; Royle Ill. 177; Watt E. D.; leaflets nearly or quite glabrous, often almost entire. Found in similar localities.

2. GARUGA, Roxb.; Fl. Brit. Ind. i, 528.

Trees; branchlets pubescent. *Leaves* alternate, exstipulate, imparipinnate, crowded towards the ends of the branches, with opposite subsessile crenate leaflets. *Flowers* polygamous, in much-branched panicles. *Calyx* campanulate, 5-fid, valvate, clothed within by the ample disk. *Petals* 5, inserted on the tube of the calyx, induplicate-valvate. *Stamens* 10, equal, inserted in the tube of the calyx at the margin of the disk; *filaments* hairy at the base. *Ovary* sessile, 4-5-celled; *style* erect; *stigma* capitate, 4-5-lobed; *ovules* 2 in each cell. *Drupe* globose, fleshy, containing 1-5 one-seeded pyrenes.—Species about 7, inhabiting Tropical Asia, America and Australia.

G. pinnata, *Roxb. Hort. Beng. 33; Fl. Ind. ii, 400; W. & A. Prod. 175; Royle Ill. 174; Brand. For. Fl. 162, t. XIII; F.B. I. i, 528; Watt E. D.* Vern. *Kharpat, ghogar* (Oudh).

A tree. *Leaves* one foot or more, pubescent when young, afterwards glabrous; *leaflets* ovate, obtusely acuminate, oblique, crenate. *Flowers* ½-¾ in. long, in large compound pubescent panicles. *Calyx*-teeth ovate. *Petals* linear, inserted between the calyx-teeth. *Disk* completely clothing the tube of the calyx. *Stamens* about equalling the petals. *Ovary* ovoid, tapering into the hairy style; *stigma* capitate, 3-lobed. *Drupe* black, about the size of a gooseberry.

Dehra Dun and Saharanpur forests, Rohilkhand, Oudh and Gorakhpur. DISTRIB.: eastward to Burma, and south to the Nilgiris, ascending to 3,000 ft. on the outer Himalaya; also in the Malay Archipel. and Philippines. Frequently associated with *Odina Wodier*. Flowers April-May, fruit ripens October-November. The bark is employed for tanning, and a greenish-yellow gum-resin exudes from it. The acid drupe is eaten raw, pickled or cooked, and the foliage is valued as fodder for elephants.

3. COMMIPHORA, Jacq.

BALSAMODENDRON IN FL. BRIT. IND. I, 529.

Balsamiferous trees or shrubs. *Branches* often spiny. *Leaves* usually 3-foliolate, the lateral leaflets sometimes small or absent. *Flowers* small, fascicled, polygamous. *Calyx* urceolate or tubular; teeth usually 4, valvate. *Petals* usually 4, inserted on the edge of the disk, valvate. *Stamens* 8-10, on the edge of the disk, alternately

long and short; *filaments* dilated below. *Disk* concave. *Ovary* sessile, 2-4-celled; *ovules* 2 in each cell; *style* short; *stigma* 3-4-lobed. *Drupe* ovoid, resinous, containing a 1-3-celled nut or 2-3 nuts.—Species about 63, distributed over Tropical Asia and Africa, usually in the desert tracts.

C. Myrrha, Engl., a small tree found in Arabia, is the source of the true 'Myrrh.' *C. Opobalsamum*, Engl. yields the 'Balm of Gilead.' It is a small tree or shrub found in Trop. Arabia, Abyssinia and Somaliland.

C. Mukul, *Engl. in DC. Monogr. Phan.* iv, *12*. Balsamodendron Roxburghii, *Stocks; D. & G. Bomb. Fl. Suppl. 19* (*not of Arn.*). B. Mukul *Hook. ex Stocks in Kew Journ.*, i, *259*, *t. 8.*; *Brand. For. Fl. 64*; *F.B. I.* i, *529*. *Watt E. D.* Vern. *Gugal*. (Indian Bdellum.)

A small tree, or more usually a stunted bush, with thick spreading branches ending in a sharp spine. *Leaflets* 1-3, nearly sessile, obovate, toothed at the end, smooth and shining. *Flowers* nearly sessile, a few in each fascicle, 1-sexual, the male with a small abortive ovary, the female with short staminodes. *Calyx* cylindrical, glandular-hairy. *Petals* 4-5, ligulate, longer than the calyx, recurved at the tips, brownish-red. *Disk* 8-10-toothed. *Stamens* 8-10. *Stigma* obscurely 2-lobed. *Drupe* red, ovate-acuminate, containing two 2-celled stones, rarely 4-valved.

Merwára, on rocky ground. DISTRIB.: Sindh, Katiawar, Rajputana, Berar, Khandeish, Mysore; also in Baluchistan. Flowers in March and April. The gum-resin, known as 'Gugul,' exudes from incisions made into the bark during the cold season. The medicinal properties of this gum are fully described in Watt's Dictionary.

XXXII.—MELIACEÆ.

TREES or shrubs. *Leaves* alternate exstipulate, usually pinnate, *Flowers* hermaphrodite or polygamo-dicœceous, regular, usually in axillary panicles. *Calyx* usually 3-6-lobed. *Petals* 3-6. *Stamens* 4-12, inserted outside the base of the hypogynous disk; *filaments* united in a tube, or rarely free; *anthers* erect, usually sessile on the tube, included or exserted, bursting longitudinally. Hypogynous *disk* annular, tubular or 0, free or connate with the ovary. *Ovary* usually free, 2-5-celled; *style* single; *ovules* 1-2, rarely more. *Fruit* capsular, drupaceous or a berry. *Seeds* with or without albumen, often inclosed in an aril.—About 300 species, mostly tropical, and widely spread over both hemispheres.

The Mahogany tree (*Swietenia Mahogani*, *L.*) indigenous in C. America and the W. Indies, was introduced into India in 1796. The first experiments were carried out in the Calcutta Botanic gardens under the

superintendence of Dr. Roxburgh, and with excellent results. There are some fine specimens in the Saharanpur garden over 80 years old.

Filaments united
- Seeds not winged, ovules 1-2 in each cell.
  - Stam-tube cylindrical, fruit a drupe . . 1. MELIA.
  - Stam-tube globular, fruit a 3-celled capsule . 2. AMOORA.
  - Stam-tube divided into 8-10 bidentate segments fruit a 2-celled 1-seeded capsule . . . 3. HEYNIA
- Seeds winged, ovules many . . . . 4. SOYMIDA.

Filaments free, fruit a capsule . . . . 5. CEDRELA.

1. MELIA, Linn. ; Fl. Brit. Ind. i. 543.

Trees. *Leaves* pinnate or 2-3-pinnate ; *leaflets* toothed or entire. *Flowers* in axillary panicles ; pubescence often stellate-mealy. *Calyx* short, 5-6-lobed, imbricated. *Petals* 5-6, free, spathulate-oblong, spreading, imbricate in bud. *Staminal*-tube cylindrical, dilated at the base and apex, 10-12-striate and toothed ; *anthers* 10 or 12, included or partly exserted, short, inserted near the apex. *Disk* annular. *Ovary* 3-6-celled ; *style* slender, nearly as long as the stam-tube ; *stigma* capitate ; *ovules* 2, superposed. *Fruit* a drupe. *Seeds* with or without albumen ; *cotyledons* leafy.—Species about 5, in Tropical Asia and in Australia.

Leaves pinnate, flowers white, drupe 1-celled 1. *M. Azadirachta.*

Leaves bipinnate, flowers lilac, drupe usually 5-celled . . . . . 2. *M. Azedarach.*

1. **M. Azadirachta,** *Linn. Sp. Pl. 385 ; Roxb. Fl. Ind. ii, 394 ; F. B. I. i, 544 ; Watt E. D.* M. indica, *Brand. For. Fl. 67.* Azadirachta indica, *A. Juss. ; W. & A. Prrd. 118 ; Royle Ill. 140 ; D. & G. Bomb. Fl. 36.* Vern, *Nim.* (Neem or Margosa tree).

A large tree. *Leaves* 8-15 in. long, crowded near the ends of the branches, simply pinnate ; *leaflets* 9-15, shortly stalked, 1-3 in. long, lanceolate, acuminate, oblique or subfalcate, often somewhat lobed near the obtuse base, serrate, glabrous. *Flowers* ⅛-¼ in. long, white, honey-scented. *Calyx* 5-fid, with obtuse or rounded lobes. *Petals* shortly ciliate. *Anthers* nearly equalling the obtuse teeth of the staminal-tube. *Ovary* 3-celled. *Drupe* oblong ½-¾ in. long, 1-celled, 1-seeded.

Planted or self-sown throughout the area. Stewart mentions that there are one or two places in the Bijnor forests where it is doubtfully wild ; and in the Dehra Dun and Saharaupur forests it has all the appearance of an indigenous tree. DISTRIB. : Westward to the Jhelum, and over the greater portion of India, ascending to 5,000 ft. in Kumaon. The tree is

never quite leafless; flowers March-May, and the fruit ripens in July and August. Almost every portion of this valuable tree, which is held sacred by Hindus, possesses some medicinal property. The wood is much valued for the construction of carts and agricultural implements, and is also used for making idols. From the pulp of the fruit an acrid bitter oil (margosa) is extracted. This is used medicinally and also for burning. For information on other useful properties yielded by this tree Dr. Watt's Dictionary should be consulted.

2. M. Azedarach, *Linn. Sp. Pl 384; Roxb. Fl. Ind. ii, 395; W. & A. Prod. 117; Brand. For. Fl. 68. F. B. I. i, 544; Watt E.D.* M. sempervirens, *Swartz.; Roxb.; Fl. Ind l. c.; D. & G. Bomb. Fl. Snppl. 15.* M. Bukayun, *Royle Ill. 141.* Vern. *Bukain, dek.* (Persian Lilac).

A moderate-sized tree, up to 40 ft. high. *Leaves* 9-18 in., 2-pinnate and occasionally 3-pinnate; *leaflets* ½-⅔ in. long, ovate or lanceolate, serrate or entire, acuminate, base more or less oblique. *Flowers* ¼-½ in. long, lilac, honey-scented. *Calyx* deeply lobed; lobes lanceolate-oblong. *Petals* linear-spathulate, minutely hairy. *Anthers* nearly equalling the linear-lanceolate teeth of the purple staminal-tube. *Ovary* 5-celled. *Drupe* ½-¾ in. in diam., 5-celled and 5-seeded, or fewer by abortion.

This tree is believed to be wild in the Dehra Dun and Saharanpur forests, and along the base of the Himalaya in Rohilkhand and N. Oudh; but it is also extensively cultivated throughout the area. DISTRIB.: Baluchistan and Persia; cultivated throughout India, especially in the Punjab Plain, and up to 5,800 ft. on the Himalaya. Flowers March-May, and the fruit ripens during the cold season. Various portions of this tree are used medicinally, and the stones of the fruit after being perforated are made into necklaces and rosaries. The leaves are much used as fodder. It is indigenous in Jamaica, and in C. America, and is known there as the 'West Indian Bead-tree.'

2. AMOORA, Roxb.; Fl. Brit. Ind. i. 559.

Trees. *Leaves* usually unequally pinnate; *leaflets* oblique, quite entire. *Flowers* in sub-dioecious axillary panicles; females in spikes or racemes. *Calyx* 3-5-partite or -fid. *Petals* 3-5, thick, concave, imbricated. *Staminal* tube subglobose or campanulate, minutely 6-10-crenate; *anthers* 6-10, included. Disk 0. *Ovary* sessile, short, 3-5-celled; cells 1-2-ovuled; *stigma* usually sessile. *Capsule* subglobose, coriaceous, 3-4-celled and-seeded, loculicidally 3-5-valved. *Seeds* inclosed in a fleshy aril.—Species about 25, restricted to India and the Malay Archipelago, with the exception of one endemic species in Australia.

A. Rohituka, *W. & A. Prod. 119; Brand. For. Fl. 69; F. B. I. i. 559; Watt E. D.* Andersonia Rohituka, *Roxb.; Fl. Ind. ii, 213.* Vern. *Harin harra, sohaga* (Oudh).

A moderate-sized evergreen tree. Young parts tawny-pubescent. *Leaves* 1-3 ft. *Leaflets* 9-15, shortly stalked, opposite, 3-9 in. long, elliptic or ovate-acuminate, base usually obtuse. Male spikes panicled; female simple. *Flowers* white, bracteate, subsessile. *Calyx* 5-partite. *Petals* 3. *Anthers* 6. *Ovary* 3-celled, with 2 superposed ovules in each cell. *Fruit* 3-celled and 3-valved, 1-1½ in. in diam., smooth, pale yellow or reddish.

Gonda dist. (N. Oudh). DISTRIB.: Assam, Bengal to S. India and Ceylon, Burma, Andaman Islands, Malay Pen.; also in the Malay Archipelago and the Philippines. In Bengal an oil is obtained from the seeds, which is used for burning and also for medicinal purposes.

3. HEYNIA, Roxb.; Fl. Brit. Ind. i. 565.

Trees, rarely shrubs. *Leaves* 5-11-foliolate; *leaflets* opposite, entire. *Panicles* terminal and axillary, corymbose, long-peduncled. *Flowers* small, bisexual. *Calyx* short, 4-5-fid., imbricated. *Petals* 4-5, oblong, slightly imbricated. *Staminal*-tube 8- or 10-fid.; lobes linear, bidentate at the apex, bearing the anthers between the linear teeth. *Disk* annular, fleshy. *Ovary* immersed in the disk, 2-3-celled, narrowing into the short style; *stigma* 2-3-dentate, with a thickened ring at the base; *ovules* 2 in each cell. *Fruit* capsular, 1-celled, 2-valved, 1-seeded, glabrous. *Seeds* with a thin white aril, without albumen.—Species 1-3, restricted to India and the Indian Archipelago.

H. trijuga, *Roxb. Hort. Beng. 33; Fl. Ind. ii, 390; Royle Ill. 141; D. & G. Bomb Fl. 38; Brand. For. Fl. 70; F.B.I. i, 565.* H. quinquejuga, *Roxb. l.c. 391; W. & A. Prod. 121.*

A moderate-sized tree. *Leaves* up to 5 in. long. *Leaflets* 5-11, ovate-oblong or lanceolate, acuminate, shortly stalked, glabrous above, paler and somewhat pubescent beneath, base obtuse. *Panicles* nearly equalling the leaves. *Flowers* white. *Calyx* 5-4-fid. *Petals* 5-4. *Filaments* 10 or 8, alternately rather shorter. *Capsule* round, ½-¾ in long.

Forests of N. Oudh. DISTRIB.: Sub-Himalayan tract, from Kumaon to Bhutan, Bengal, W. & S. India, Burma, Malay Penin. The bark and leaves possess bitter and tonic principles.

4. SOYMIDA, A. Juss.; Fl. Brit. Ind. i, 567.

Trees with paripinnate leaves; *leaflets* opposite, entire, obtuse. *Panicles* axillary and terminal. *Flowers* 2-sexual, 5-merous. *Calyx* 5-cleft. *Petals* free, imbricated, obovate, clawed, spreading. *Staminal* tube short, cup-shaped, 10-cleft, lobes bidentate; *anthers* 10, sessile between the teeth, *Disk* flat. *Ovary* 5-celled, each with about 12 biseriate pendulous ovules; *style* short; *stigma* broad, fleshy,

Capsule septifragally 5-valved, woody; valves consisting of 2 plates separating from the winged axis. *Seeds* many, flattish, winged at both ends, albuminous; *cotyledons* leafy.—Species 2, one confined to India and the other Tropical African.

S. febrifuga, *A. Juss. in Mém. Mus. Par. xix, 251, t. 22, f. 26; W. & A. Prod. 122; D. & G. Bomb. Fl. 38; Brand. For. Fl. 71; F. B. I. i, 567; Watt E. D.* Swietenia febrifuga, *Roxb. Fl. Ind. ii, 398.* Vern. *Rohan, rakat.*

A large glabrous tree, 70-80 ft. high. *Bark* of trunk very rough, peeling off in large plates or scales. *Leaves* nearly evergreen, 9-18 in. long; *leaflets* 6-12, elliptic or oblong, base usually oblique, shortly stalked. *Panicles* often equalling the leaves, branches divaricate. *Flowers* about ¼ in. long, greenish-white. *Bracts* small, triangular. *Capsule* 1-1½ in. long, smooth, black when ripe.

Hills south of Mirzapur, and in Bundelkhand. DISTRIB.: Chota Nagpur and south to Travancore and Ceylon. Flowers April and May, and the fruit ripens in July and Aug. The bitter astringent bark has been used as a substitute for *cinchona*. The reddish-brown wood is strong and durable, and is much valued.

5. CEDRELA, Linn.; Fl. Brit. Ind. i, 568.

Trees with pinnate leaves and small 2-sexual flowers in terminal panicles. *Calyx* short, 5-cleft. *Petals* free, suberect, imbricated. *Stamens* 4-6, free, inserted at the top of the disk, sometimes alternating with staminodes; *filaments* subulate; *anthers* oblong, versatile. *Disk* thick or raised, 4-6-lobed. *Ovary* sessile on the top of the disk, 5-celled; *ovules* 8-12 in each cell, 2-seriate, pendulous; *style* filiform; *stigma* discoid. *Capsule* coriaceous, 5-celled, septifragally 5-valved. *Seeds* compressed, winged below or at both ends, albumen fleshy.—Species about 12, inhabiting Tropical Asia, Australia and America.

C. Toona, *Roxb. ex Rottl. in Gen. Naturf. Fr. Neue Schr. ii, 198; Fl. Ind. i, 635; W. & A. Prod. 124; Royle Ill. 142; D. & G. Bomb. Fl. 38; Brand. For. Fl. 72, t. XIV; F. B. I. i, 568 (excl. syn. C. serrata, Royle). Watt E. D.* Vern. *Tun.* (The Toon tree.)

A large handsome deciduous tree. *Leaves* 1-2 ft. long, paripinnate; *leaflets* stalked, obliquely ovate or lanceolate, acuminate, entire or with undulate edges, glabrous and shining. *Panicles* nearly as long as the leaves, drooping, pubescent. *Flowers* small, shortly pedicelled, cream-coloured, honey-scented. *Calyx*-lobes obtuse, ciliate. *Petals* oblong, ciliate. *Stamens* 5, inserted on the 5 fleshy orange-coloured hairy lobes of the disk. *Stigma* peltate, 5-lobed. *Capsule* oblong ¾-1 in. long. *Seeds* with a membranous wing at each end.

Forests of Dehra Dun, Saharanpur, Rohilkhand, Oudh and Gorakhpur. It is also grown in gardens, and extensively planted along roadsides and canal-banks. DISTRIB.: Sub-Himalayan tract up to 4,000 ft., from the Indus eastwards, Bengal, Burma and S. India, extending to Java and Australia. Flowers March and April, and the fruit ripens during June and July. From the flowers a sulphur-coloured dye called 'basanti' is extracted, and the bark is used medicinally. The tree, however, is chiefly valued on account of its timber, which is largely used for furniture and for carving. It is sometimes called 'Indian Mahogany.' Allied to this species is *C. serrata*, Royle (Ill. t. 25), found in moist shady valleys, up to 8,000ft. on the adjacent Himalayan ranges. It differs by its larger palm-like leaves and serrate leaflets, the much larger panicles, and by its seeds which are winged at the apex only.

XXXIII.—OLACINEÆ.

TREES or shrubs, rarely herbs, sometimes climbing. *Leaves* usually alternate, simple or lobed, without stipules. *Flowers* in terminal axillary or extra-axillary cymes, rarely capitate, regular, hermaphrodite or 1-sexual, often dicœcious, sometimes monochlamydeous. *Calyx* usually small, 4-5-toothed. *Petals* 3-6, free or more or less coherent. *Stamens* 3-15, inserted with the petals, free or adnate to them, all fertile or some reduced to staminodes, separate or more or less monadelphous. *Disk* hypogynous, cup-shaped. *Ovary* free or ½-inferior, 1-celled or imperfectly 2-3-5-celled; *style* simple or 0, rarely divided; *ovules* 1-5, pendulous. *Fruit* drupaceous, or dry and indehiscent, 1-celled, 1-seeded, free or more or less adnate to the calyx-tube and disk. *Seed* pendulous; *albumen* fleshy, rarely 0.—Species about 220, widely distributed throughout the Tropics.

Perianth double; stamens 3, with 5-6 staminodes .	1. OLAX.
Perianth single; stamens 4 or 5, alternating with 4-5 staminodes	2. CANSJERA.

1. OLAX, Linn.; Fl. Brit. Ind. i, 574.

Trees or shrubs, often scandent, sometimes prickly. *Leaves* alternate, petioled, simple. *Racemes* axillary, simple or branched. *Bracts* minute. *Calyx* minute, cup-shaped, truncate or obscurely toothed, accrescent. *Petals* 3-6, hypogynous, valvate, more or less coherent. Fertile *stamens* usually 3. *Staminodes* 5-6, bifid, usually opposite the petals. *Ovary* free, usually surrounded by a shallow cup-shaped hypogynous disk, more or less 3-celled below, 1-celled above; *style* simple, terminal; *stigma* 3-lobed; *ovules* 3, linear, pendulous from the apex of a central placenta. *Fruit* more or less

covered by the accrescent fleshy calyx. *Stone* crustaceous, 1-celled, 1-seeded. *Embryo* minute, in the apex of albumen.—Species about 30, inhabiting the tropics of the Old World.

A prickly climber, flowers in racemes . . . 1. *O. scandens.*
A small undershrub; peduncles solitary, 1-flowered 2. *O. nana.*

1. O. scandens, *Roxb. Pl. Corom. ii. 2, t. 102; Fl. Ind. i, 163; W. & A. Prod. 89; D. & G. Bomb. Fl. 27; Brand. For. Fl. 75; F. B. I. i, 575; Watt E. D.*

A stout prickly climber. Leaves distichous, ovate-oblong. *Flowers* small, white, in short axillary racemes. Fertile *stamens* 3. *Drupe* globose or ovoid, more than half inclosed in the enlarged calyx, yellow, fleshy.

Rohilkhand and Northern Oudh, usually in damp shady places or near rivers. DISTRIB.: Sub-Himalayan tract in Kumaon, Chota Nagpur, C. and S. India, Ceylon, Burma; also in Java. Flowers during the cold season. As a climber it is very destructive to trees.

2. O. nana, *Wall. Cat. 6783; Royle Ill. 123; Brand. For. Fl. 75; F. B. I. i, 576; Watt E. D.*

A small undershrub, with a contracted woody stock, from which herbaceous rod-like shoots are annually produced during the rainy season. *Leaves* nearly sessile, lanceolate, glabrous, glaucous beneath, margins recurved. *Peduncles* solitary, 1-flowered. Fertile *stamens* 3, opposite the petals, shorter than the staminodes. *Fruit* small, globular.

Siwalik range, Rohilkhand, N. Oudh, and Gorakhpur. DISTRIB.: In hot valleys of the W. Himalaya, from the Punjab to Nepal, ascending to 5,000 ft.; also in Bengal. This is one of those remarkable plants, which like *Grewia sapida, Combretum nanum,* etc., have become normally dwarfed owing to periodical jungle-fires. The flowers appear during April and May. The leaves turn black when drying.

2. CANSJERA, Juss.; Fl. Brit. Ind. i. 582.

Climbing shrubs, sometimes spiny. *Leaves* alternate, shortly petioled, 1-nerved. *Flowers* bracteate, in dense axillary spikes, monochlamydeous, hermaphrodite. *Perianth* regular, 4-5-parted, lobes valvate. Fertile *stamens* 4-5, alternating with 4-5-ovoid or subtriangular staminodes. *Ovary* free, ovoid-conical, 1-celled; *style* cylindric; *stigma* capitate, 4-lobed; *ovule* solitary, pendulous. *Fruit* a drupe, surrounded at the base by the marcescent perianth. *Stone* bony. *Seed* solitary, erect; *embryo* in the apex of fleshy albumen.—Species 3-4, natives of Tropical Asia and Australia.

This genus, by reason of the flowers having only a single perianth, has by some authors been placed in *Thymelaceæ.*

C. **Rheedii,** *Gmel. Syst. i, 280; Royle Ill. 321; Brand. For. Fl. 75; F. B. I. i, 582.* C. scandens, *Roxb.; Fl. Ind. i, 441.*

A large evergreen climbing shrub; young parts and inflorescence pubescent; branches sometimes spiny. *Leaves* 1½-3 in. long, ovate or oblong-lanceolate, rounded and sometimes oblique at the base, shortly stalked, coriaceous, wrinkled and turning yellow when dry. *Spikes* axillary, solitary or twin, many-flowered; *bracts* minute. *Flowers* sessile, yellow. *Perianth* small, urceolate. *Fruit* ovoid, about ½ in. long, orange-red, tipped by the remains of the *style*.

Forests of Oudh, in damp shady places. DISTRIB.: From Behar and the Konkan southward to Ceylon, and in the Malay Penins.; also in the Malay Archipelago, Hongkong and N. Australia.

XXXIV. ILICINEÆ.

SHRUBS or trees. *Leaves* alternate, simple, usually coriaceous and evergreen; *stipules* minute or 0. *Flowers* small, in axillary cymes, fascicles or umbellules, usually dioecious. *Calyx* 3-6-cleft, imbricate in bud, persistent. *Petals* usually 4-5, free or connate at the base, imbricate, deciduous. *Stamens* 4-5, adhering to the bases of the petals, or sometimes free and hypogynous in the female flowers; *filaments* subulate; *anthers* dorsifixed. *Disk* 0. *Ovary* free, 3-16-celled; *style* usually short or 0; *stigma* capitate or discoid; *ovules* pendulous, 1 or 2 in each cell. *Drupe* with 2 or more 1-seeded free rarely connate stones. *Seed* with a membranous testa, albumen fleshy. *Embryo* minute.—Species mostly tropical.

ILEX, Linn.; Fl. Brit. Ind. i. 598.

Calyx 4-lobed or-parted. *Corolla* rotate. *Petals* free or connate at the base. *Stamens* 4-5, adhering to the base of the corolla in the male flower, sometimes hypogynous in the female. *Ovary* 2-12-celled; *stigma* free or confluent on the top of the ovary. *Drupe* usually globose, with 2-16 stones.—Species about 170, of which 24 are described in the Fl. Brit. Ind.

To this genus belongs the English Holly, *I. aquifolium, L.*, also *I. paraguayensis*, the leaves of which yield the 'Mate' or Paraguay tea. The latter thrives in gardens in the plains of Northern India.

I. Doniana. *DC. Prod. ii, 644*, I. excelsa, *Wall. (exsulca)*; *Royle Ill. 167; Brand. For. Fl. 76 (excl. syn. Ehretiæ)*; *F. B. I. i, 603.*

A medium-sized evergreen tree. Young shoots and under surface of young leaves and inflorescence pubescent. *Leaves* 2-4 in. long, ovate or lanceolate, acuminate, quite entire, rather thin, glabrous, base acute, lateral nerves arcuate; petiole slender ½-1 in.; *stipules* 2, minute. *Umbellules* very shortly and stoutly peduncled. *Flowers* 4-5-merous. *Calyx* lobes ovate, obtuse, ciliate. *Petals* ovate-rotundate, crenulate, united

at the base in both sexes. *Stamens* equalling the petals, inserted on the corolla in both sexes; *filaments* dilated at the base. *Drupe* globose with 5 trigonous stones; *stigma* 4-5 lobed.

Siwalik range (Brandis). DISTRIB.: Sub-tropical Himalaya from Jaunsar and Tehri-Garhwal to Bhutan (exclusive of Sikkim), up to 6,000 ft.; also on the Khasia hills.

XXXV.—CELASTRINEÆ.

TREES or shrubs, erect or climbing. *Branches* sometimes spinescent. *Leaves* opposite or alternate, usually coriaceous, simple, petioled, rarely subsessile; *stipules* caducous or 0. *Flowers* hermaphrodite or polygamous, usually cymose. *Calyx* small, 4-5-lobed, imbricate, persistent. *Petals* 4-5, rarely 0, inserted below the disk or continuous with its margin, imbricate or valvate. *Stamens* 3-5, rarely 2 or more than 5; *filaments* subulate or flattened. *Disk* usually conspicuous, rarely 0. *Ovary* sessile, 3-5-celled; *style* short or 0; *stigma* triangular, rarely 3-partite; *ovules* usually 2 in each cell. *Fruit* dehiscent or indehiscent. *Seed* usually arillate, sometimes winged; *albumen* fleshy or 0.—Species about 400, distributed over the temperate and tropical parts of the world.

Fruit a 2-5-celled capsule, stamens 4-5; seeds arillate, albuminous.	
Leaves opposite, capsule lobed . . .	1. EUONYMUS.
Leaves alternate, capsule not-lobed . .	2. CELASTRUS.
Fruit a drupe, stamens 5; seeds without an aril, albuminous	3. ELÆODENDRON.
Fruit of 1-3 dry 2-valved compressed carpels, stamens 3; seeds winged, exalbuminous .	4. HIPPOCRATEA.

1. EUONYMUS, Linn.; Fl. Brit. Ind. i. 607.

Trees or shrubs, rarely scandent, glabrous. *Leaves* petioled; *stipules* caducous. *Calyx* 4-5-cleft. *Petals* 4-5, imbricate. *Stamens* 4-5, inserted with the petals on the broad fleshy 4-5-lobed disk. *Ovary* sunk in the disk, 3-5-celled; *ovules* 2 in each cell. *Capsule* 3-5-celled, lobed, angled or winged, coriaceous; cells 1-2-seeded, loculicidal. *Seeds* enclosed in an aril, albuminous.—Species about 60, found in temperate regions and in mountainous parts of the tropics.

E. Hamiltonianus, *Wall. in Roxb. Fl. Ind. ii, 403; Royle Ill. 167; Brand. For. Fl. 78, t. xvi; F. B. I. i, 612; Watt E. D.* E. atropurpureus, *Roxb. Fl. Ind. i, 627 (non Jacq.)*

A shrub or small tree with terete glabrous green branches. *Leaves* 2-6in. long, ovate or ovate-lanceolate, acuminate, serrulate, glabrous, membranous; *petioles* ¼-½ in. long. *Flowers* greenish-white, in dichotomous cymes; *bracts* minute, deciduous. *Petals* oblong, obtuse. *Capsule* 4-lobed, not winged, yellow.

Dehra Dun (Wallich, Royle). DISTRIB.: Temperate Himalaya, from Kashmir to Kumaon, up to 9,000 ft.; also on the Khasia Hills. Flowers March-May. The white close-grained wood is used for making spoons, and the branches are lopped for fodder.

2. CELASTRUS, Linn.; Fl. Brit. Ind. i. 617.

Erect or climbing shrubs, or small trees, often spinous. *Leaves* alternate; *stipules* minute, deciduous or 0. *Flowers* in terminal or axillary panicles or racemes, or dichotomously cymose, sometimes polygamous. *Calyx* 4-5-cleft. *Petals* 4-5, spreading. *Disk* flat or cup-shaped *Stamens* 5, inserted upon or under the margin of the disk. *Ovary* 2-4-celled; *style* short, 2-3-lobed; *ovules* 2 in each cell. *Capsule* globose or obovoid, 1-3-celled. *Seeds* 1-2 in each cell, completely or partially inclosed in an aril; *albumen* fleshy; *cotyledons* foliaceous.—Species abont 87, distributed over the hotter parts of the world.

Unarmed climbing shrubs, flowers in terminal or axillary panicles or racemes, stamens inserted on the margin of the disk.	
Flowers in long terminal pendulous panicles, style not lobed . . .	1. *C. paniculata.*
Flowers in short axillary or terminal racemes, style 3-lobed	2. *C. stylosa.*
Erect spinous shrubs, flowers in axillary cymes, stamens inserted beneath the margin of the disk.	
Capsule turbinate, 3-cornered . . .	3. *C. spinosus.*
Capsule globose	4. *C. senegalensis.*

C. paniculata, *Willd. Sp. Pl. i, 1125; Roxb. Fl. Ind. i, 621; W. & A. Prod. 158; D. & G. Bomb. Fl. 47; Brand. For. Fl. 82; F. B. I. i, 616; Watt E.D.* C. multiflora, *Roxb. l c. 622.* C. nutans, *Roxb. l.c. 623; Royle Ill. 167.* Vern. *Málkángni, málkákni* (Oudh).

A large unarmed climber with pendulous branches. *Leaves* 2½-5 in. long, ovate or obovate, acuminate, crenate, membranous, glabrous. *Flowers*

yellowish-green, 1-sexual, in elongated terminal compound pubescent panicles; *bracts* fimbriate. *Calyx*-lobes rounded, toothed. *Petals* entire. *Stamens* inserted on the free margin of the disk; *anthers* large. *Style* acute, not lobed. *Capsule* globose, bright yellow when ripe, generally 3-celled, 3-valved and 3-6-seeded. *Seeds* completely inclosed in a red aril.

Common in Dehra Dun, on the Siwalik range and in other parts of the area. DISTRIB.: Subtropical Himalaya up to 4,000 ft. and in the hilly parts of India from the Punjab eastward, and south to Ceylon: also in the Malay Archipelago and the Philippines. Flowers April-June. The leaves and seeds are used medicinally, as also the oil extracted from the seeds.

2. C. stylosa. *Wall. in Roxb. Fl. Ind. ii, 401; F. B. I. i, 618.*

A climbing unarmed shrub. *Leaves* 2½-4in. long, elliptic or ovate-oblong, acute or sub-acuminate, serrate. *Flowers* in short axillary or terminal racemose cymes. *Petals* oblong, with wavy margins. *Style* 3-lobed *Capsule* yellow, 3-celled, 3-6-seeded, crowned by the persistent style.

Dehra Dun. DISTRIB.: Sub-tropical Himalaya, from Nepal to Sikkim, up to 6,000 ft.; also on the Khasia hills.

3. C. spinosa, *Royle Ill. 167; Brand. For. Fl. 80; Watt E.D.* C. Royleana, *Wall.* Gymnosporia Royleana, *Laws. in F. B. I. i, 620.* Vern. *Gwála dárim.*

A glabrous densely-branching shrub, armed with stiff straight axillary spines. *Leaves* shortly stalked, ¾-1¼ long, broadly ovate or obovate, crenate or nearly entire, coriaceous, dull greyish-green. *Cymes* axillary subsessile, often fascicled on short dichotomous branches. *Bracts* and *calyx*-lobes ciliate. *Petals* oblong, white or reddish with white margins. *Stamens* inserted under the edge of the disk; *anthers* versatile. *Disk* 5-lobed, surrounding the base of the 3-celled ovary. *Capsule* ¼in. long, turbinate, 3-cornered and 3-celled. *Seeds* partially covered with an aril.

Dehra Dun and Siwalik range, Bundelkhand (Brandis). DISTRIB.: Outer W. Himalaya, from the Jumna to Kumaon, up to 4,000 ft., also in the Punjab and extending into Afghanistan. The yellow close-grained wood has been recommended as a substitute for boxwood for carving and engraving.

4. C. senegalensis, *Lamk. Encycl. i, 661; Brand. For. Fl. 81; Watt E.D.* C. montanus, *Roth; Roxb. Fl. Ind. i, 620; W. & A. Prod. 159; D. & G. Bomb. Fl. 48.* Gymnosporia montana, *Benth. Fl. Austral i, 400; F. B. I. i, 621.*

A tall spinous shrub or small tree, with stiff branches forming a loose crown, glabrous, glaucous or pale green; spines straight, axillary, 1-2 in. long and often bearing leaves and flowers. *Leaves* obovate to linear-spathulate, but very variable in form and size, entire or crenate, coriaceous. *Cymes* axillary and shorter than the leaves, or on the spines, rigid, divaricating. *Flowers* small, greenish-white, often sterile *Bracts*, *calyx*-lobes and *petals* fimbriate. *Disk* broad, flat, 10-lobed

Anthers versatile. *Stigma* 3-lobed. *Capsule* globose or ovoid, black, about the size of a small pea, 1-3-celled. *Cells* usually 1-seeded.

Dehra Dun (Gamble), Siwalik range, Merwára, Bundelkhand. DISTRIB.: Punjab, Parasnáth in Behar, and drier parts of C. & S. India; also in C. Africa, Malay Archipel. and Australia. *C. montana* of Roth has fewer spines on the branches and larger and broader leaves. In typical *C. senegalensis* the stems are robust and profusely armed and the leaves are smaller and narrower.

3. ELÆODENDRON, Jacq. f.; Fl. Brit. Ind. i. 623.

Small trees or shrubs with opposite or sub-opposite crenate or entire leaves. *Flowers* in axillary dichotomous cymes, often polygamous. *Calyx* 5-cleft. *Petals* 5, spreading. *Disk* thick. *Stamens* 5; *anthers* nearly globose. *Ovary* immersed in the disk, 2-celled, with 2 erect ovules in each cell. *Fruit* a drupe; *stone* 1-3-celled; *cells* 1-rarely 2-seeded. *Seed* without an aril, albuminous.—Species about 30, natives of S. Africa, Tropical Asia, America and Australia.

E. glaucum. *Pers. Syn. i, 241; Roxb. Fl. Ind. i, 638; F. B. I. i, 623; Watt E. D.* E. Roxburghii, *W. & A. Prod. 157; D. & G. Bomb. Fl. 48; Brand. For. Fl. 82.* E. paniculatum, *W. & A. l c.* Nerija dichotoma, *Roxb. l.c. 646; Royle Ill. 167.* Vern. *Dhebri, jangela* (Dehra Dun), *chauri* (Oudh) *mámri, jamrassi kala-muka.* (Bundelkand.)

Usually a moderate sized tree, with numerous often reddish branches, forming a close oval crown. *Leaves* 2-6 in. long, on petioles ¼-1 in long, elliptic, ovate or oblong, acuminate, crenate or nearly entire, subcoriaceous; *stipules* small, deciduous. *Peduncles* longer than the petiole, branches divaricate; *bracts* small, caducous. *Calyx*-lobes broad, obtuse. *Petals* oblong, yellowish-brown edged with white. *Stamens* shorter than the petals; *filaments* recurved; *anthers* roundish. *Drupe* ½-in. long, 1-celled and 1-seeded, ovoid or obovoid, yellowish-green when ripe, tipped with the persistent style.

Dehra Dun and Saharanpur forests, Oudh, Bundelkhand. DISTRIB.: Outer Himalaya up to 6,000 ft., Chota Nagpur, Cent. Prov. to S. India and Ceylon; also in the Malay Archipelago. The tree is leafless during April. The flowers appear from February to June, and the fruit ripens about a year afterwards. The root is said to be a specific against snake-bite, and the bark and leaves are used medicinally. The handsome reddish-coloured wood is much valued, as it works well and takes a fine polish.

4. HIPPOCRATEA, Linn.; Fl. Brit. Ind. i, 623.

Small trees or scandent shrubs. *Leaves* opposite, petioled; *stipules* small, caducous. *Flowers* usually in axillary cymes, small, white or greenish. *Calyx* small, 5-parted. *Petals* 5, spreading, much larger than the calyx, imbricate or valvate. *Stamens* 3, recurved

lying in the grooves of the ovary. *Disk* conical or cupular. *Ovary* surrounded by the disk, 3-celled; *style* very short or 0; *stigmas* 1-3; *ovules* 2-10 in each cell, in 2 series, inserted on the inner angle. *Fruit* of 1-3 flattened carpels connate at the base, usually dehiscent. *Seeds* compressed, usually winged below, exalbuminous.—Species 65-70, natives of the tropics of both hemispheres.

H. arborea, *Roxb. Hort. Beng. 5; Fl. Ind. i, 66; Brand. For. Fl. 83; F. B. I. i, 625.* Vern. *Kochra (Gonda).*

A large glabrous climber with flexuose branches. *Leaves* 4-7 in. long, ovate or ovate-oblong, shortly acuminate, serrulate; *petiole* ½ in. long; main lateral nerves 6-8 pairs, arcuate. *Flowers* yellow, in axillary pedunculate cymes. Ripe *carpels* 1-3, at the end of terminal peduncles, obovate-oblong, acute at both ends, 3 in. long and 1½ in. broad, thickly coriaceous, with numerous prominent longitudinal nerves. *Seeds* 2, the wing tawny, ovate, 1½ in. long, smooth, corky; *cotyledons* fleshy, greenish-yellow.

Abundant in the forest of Bahraich and Gonda in N. Oudh, climbing over the largest trees and enveloping them with its heavy foliage. DISTRIB.: Bhutan and Khasia Mts. (Griffith), Morung Mts. (Hamilton). Flowers in June and July, and the fruit ripens during the following April.

XXXVI.—RHAMNEÆ.

TREES, or erect or scandent shrubs (cirrhose in *Gouania* and *Helinus*). *Branches* often spinous or aculeate. *Leaves* simple, alternate (opposite or sub-opposite in *Sageretia*). *stipules* small, deciduous, or changed into prickles. *Flowers* small, green or yellow, usually in axillary cymes, often 1-sexual. *Calyx* 4-5-lid.; lobes triangular, usually keeled within, valvate. *Petals* 4-5 or 0, inserted on the throat of the calyx-tube, usually shorter than the lobes of the calyx. *Disk* annular, cupular, or filling or coating the calyx-tube. *Stamens* 4-5, inserted with the petals and opposite to them, and often inclosed within their folds; *anthers* versatile. *Ovary* free or immersed in the disk, free or more or less adherent to the calyx-tube, usually 3-celled, with 1 ovule in each cell. *Fruit* free, or girt at the base or middle by the adhering calyx-tube, usually indehiscent, sometimes winged. *Seed* rarely without albumen.—Species over 400, inhabiting tropical and temperate parts of the world.

Fruit dry, indehiscent, winged, 1-celled; ovary ½-inferior or nearly superior. A woody climber . . . . . 1. VENTILAGO.

Fruit a fleshy drupe, stone 1-4-celled, ovary ½-inferior.
- Leaves 3-5-nerved from the base.—Prickly shrubs or trees . . . . . 2. ZIZYPHUS.
- Leaves penninerved.—An unarmed shrub . 3. BERCHEMIA.

Fruit a berry containing 2-4 stones, ovary superior.
- Leaves alternate or fascicled, flowers in axillary clusters . . . . . 4. RHAMNUS.
- Leaves opposite or subopposite, flowers in lax panicles . . . . . 5. SAGERETIA.

Fruit dehiscent, ovary inferior.—Cirrhose shrubs.
- Flowers in slender panicled racemes, fruit 3-winged . . . . . 6. GOUANIA.
- Flowers umbellate, on long slender peduncles, fruit not winged . . . 7. HELINUS.

1. VENTILAGO, Gærtn. ; Fl. Brit. Ind. i. 630.

Scandent shrubs. *Leaves* alternate, sub-bifarious. *Flowers* small usually in terminal leafless panicles. *Calyx* 5-fid.; lobes spreading keeled internally. *Petals* 5, obtriangular or cucullate. *Stamens* 5, adnate to the base of the petals. *Disk* 5-lobed, with a free margin. *Ovary* sunk in the disk, 2-celled; *style* very short *Fruit* samaroid, the nut subglobose, girt at the base or middle by the adhering calyx-tube, prolonged above into a linear or linear-oblong coriaceous wing, 1-celled, 1-seeded. *Seed* subglobose, exalbuminous.—Species about 10, scattered over the tropics of Asia, Africa, Australia and the Pacific Islands.

V. maderaspatana, *Gærtn. Fruct. 223, t. 49, f. 2,* var. *calyculata King in Journ. As. Soc. Beng. LXV, part ii, 385.* V. calyculata, *Tulasne Brand. For. Fl. 96 ; F. B. I. i, 630 ; Watt E. D.* V. maderaspatana, *Roxb. Fl. Ind. i, 629 (not of Gærtn.); W. & A. Prod. 164 (in part).* Vern. *Káli-bel* (Dehra Dun).

A large climbing shrub with woody tendrils, young parts and inflorescence pubescent. *Leaves* 2-4 in., petioled, elliptic-oblong from an oblique base, acute or acuminate, entire or crenate, glabrous when mature; main lateral nerves 6-8 pairs, arcuate. *Flowers* many, small, greenish, with an offensive smell, in long terminal leafless panicles. *Petals* deflexed. *Nut* subglobose, ¼ in. in diam., girt about the middle by the rim of the calyx-tube. *Wing* linear, 2½ in. long, pubescent, terminated by the remains of the bifid style.

Dehra Dun, Rohilkhand, Oudh, and Bundelkhand. Flowers Feb. and March and the fruit ripens in May and June. DISTRIB.: Sub-Himalayan

tract from the Jumna to Nepal; also in Bengal, C. India, W. Ghats, Bhutan and Burma, extending to Java. I follow Sir George King in regarding *V. calyculata* as merely a variety of *V. maderaspatana* of Gærtn. The type, which is not found in N. India, has more slender and almost glabrous panicles, and the wing is attached to the base of the fruit.

2. ZIZYPHUS. Juss.; Fl. Brit. Ind. i. 632.

Trees or shrubs, often decumbent or sarmentose and usually armed with sharp straight or hooked prickles (stipules). *Leaves* subbifarious, alternate, usually coriaceous. *Flowers* fascicled, or in sessile or peduncled cymes. *Calyx* 5-fid.; lobes spreading, keeled within, tube broadly obconical. *Petals* 5, rarely 0, cucullate, deflexed. *Disk* 5-10-lobed, margin free. *Stamens* 5. *Ovary* sunk in the disk and confluent with it at the base, 2-4-celled; *styles* 2-4, free or more or less united. *Fruit* fleshy or dry, with a hard 1-4-celled 1-4-seeded stone. *Seed* plano-convex; *albumen* 0, or very scanty.—Species about 40, found in tropical Asia and America, and in the temperate regions of both hemispheres.

Drupe fleshy, stone 1-2-celled.

Cymes axillary, nearly sessile, petals 5.	
A moderate-sized tree or a shrub, drupe ½-¾ in. or longer	1. *Z. Jujuba.*
A small thorny tomentose bush; drupe globose, ½-¾ in. in diam . . .	2. *Z. rotundifolia.*
A straggling or climbing shrub, drupe ¼ in. long	3. *Z. Œnoplia.*
Cymes compound, axillary and terminal, on long peduncles, petals 0	4. *Z. rugosa.*
Drupe nearly dry, stone 3-celled; cymes simple, axillary, on short peduncles, petals 4-5. .	5. *Z. Xylopyrus.*

1. Z. Jujuba, *Lamk. Encyc. iii, 318; Roxb. Fl. Ind. i, 611; W. & A. Prod. 162; Royle Ill. 168; D. & G. Bomb. Fl. 49; Brand. For Fl. 86. t. XVII; F. B. I. i, 632; DC. L'Orig. Pl. Cult. 156; Watt E. D.* Vern. *Berberi.* (Indian Jujube)

A shrub or moderate-sized tree, almost evergreen, usually armed. Young branches and flowers densely tomentose. *Leaves* variable, 1-4 in. long, ovate, ovate-oblong or sub-orbicular, obtuse or acute, entire or serrulate, dark green and glabrous above, clothed beneath with dense pale-coloured tomentum. *Prickles* solitary and straight, or in pairs with one of them shorter and recurved, rarely wanting. *Flowers* greenish-yellow somewhat fætid, arranged in short axillary subsessile cymes. *Calyx* glabrous within. *Petals* clawed, with an oblong hooded lamina. *Disk* 10-lobed. *Ovary* 2-celled; *styles* 2, connate to the middle. *Drupe* ½ to ¾ in. or longer, globose oblong

or ovoid, orange or red when ripe. *Stone* 2-celled, with a hard thick bony shell.

Common and gregarious along the base of the Saharanpur Siwaliks, also in Dehra Dun and in other parts of the area, frequently occurring as a mere shrub. DISTRIB.: Throughout India and in Ceylon, wild and cultivated; also in Trop. Africa, the Malay Archipelago, China and Australia. Flowers Sep.-Nov. and the fruit ripens from Dec. to Feb. There are some fine old trees in the Saharanpur garden which were planted more than eighty years ago. The cultivated tree is called 'Pewandi' or 'Pemdi Ber' and the wild shrubby kind is usually known as 'jharberi.' The shape and size of the fruit vary very much, being usually small and globose in the wild plant, and larger and more or less elongated under cultivation. Some excellent varieties have been produced. The fruit is largely eaten by natives, and it is much valued in times of scarcity. Various parts of the tree are used medicinally. The leaves are considered to be one of best kinds of food for tussar silk-worms, and are also largely used as fodder. The branches are often employed for making hedges, and the hard close-grained wood is highly prized for the manufacture of well-wheels, saddle-trees, etc.

2. Z. rotundifolia, *Lamk. Encyc. iii, 319.* Z. nummularia, *W. & A. Prod., 162; D. & G. Bomb. Fl. 49; Brand. For. Fl. 89; F. B. I. i, 633; Watt E. D.* Z. microphylla, *Roxb. Fl. Ind. i, 613.* Vern *Jhar-ber, jharberi, ber, kánta-ber* (Bundelkhand), *bhor & jhalbhor* (Rájputána).

A thorny tomentose bush. *Branches* grey or covered with white epidermis; *branchlets* bifarious, flexuose, pilose when young, armed with twin stipular prickles, one straight and slender, the other shorter bent down and hooked. *Leaves* ½-1 in. long, shortly stalked, ovate to orbicular, serrate, dark green and velvety above, pale and densely tomentose beneath. *Flowers* in axillary short compact cymes; *pedicels* ¼ in., longer than the peduncles. *Petals* obovate, with convolute margins. *Disk* 10-lobed, with a pit opposite each lobe. *Ovary* 2-celled; *styles* 2, united to above the middle. *Drupe* globose, ½ in. in diam, shining, red or black when ripe.

Abundant and often gregarious in the dry waste lands of the Doab, also in the ravine tracts in the vicinity of the Jumna and Chambal rivers; common in Morwára and Bundelkhand. DISTRIB.: From the Punjab and Rájputána to C. and S. India. Flowers March to June, and the fruit ripens during the cold weather. The dry branches of this plant are used very extensively for making fences, and the leaves are much valued as fodder for camels, sheep, goats, etc. The fruit is eagerly sought after by the inhabitants of famine-stricken districts.

3. Z. Œnoplia, *Mill. Gard. Dict. ed. viii, n. 3; Roxb. Fl. Ind. i, 611; W. & A. Prod. 163; Royle Ill. 168; D. & G. Bomb. Fl. 49; Brand. For. Fl. 86; F. B. I. i, 634; Watt E. D.* Z. albens, *Roxb. Fl. Ind. i, 607.* Z. Napeca, *Roxb. l. c. 612 (not of Willd.).* Vern. *Makai, makoh, bamolan.*

A thorny straggling or climbing shrub. Young branches strigose or rusty-tomentose. Stipular *prickles* short, usually solitary, straight or hooked, brown and shining, tomentose at the base. *Leaves* 1-2½ in. long, obliquely ovate-lanceolate, acute or shortly acuminate, entire or serrate, pubescent or glabrous above, and with long silky appressed

fulvous hairs beneath. Flowers in short axillary dichotomous densely pubescent cymes. *Drupe* ¼ in. in diam., globose or obovoid, black and shining.

Abundant within the area. DISTRIB.: Hotter parts of India, from the Punjab and W. Himalaya to Assam, and south to Ceylon and the Malay Penins.; also in Australia. Flowers in April and May, and the fruit ripens during the rainy season. Often planted in hedges. The fruit is eaten.

4. **Z. rugosa,** *Lamk. Encyc. iii, 319; W. & A. Prod. 162; D. & G. Bomb. Fl. 49; Brand. For. Fl. 89; F. B. I. i, 636; Watt E. D.* Z. glabra, *Roxb. Fl. Ind. i, 614.* Z. latifolia, *Roxb. l. c. 607.* Vern. *Ber, bhand.*

A straggling evergreen shrub, often climbing, or occasionally a small tree. Young branches, inflorescence, prickles and under side of leaves usually clothed with dense rusty-coloured tomentum. *Prickles* broad-based, strong and hooked, mostly solitary. *Leaves* 2-5 in. long, ovate or elliptic from an oblique often cordate base: main nerves usually 3 to 4, lateral nerves prominent. *Flowers* in long peduncled axillary and terminal cymes, forming on the usually leafless branches long terminal panicles. *Calyx* pubescent inside. *Petals* 0. *Disk* 5-lobed, hairy. *Styles* 2, united below the middle. *Drupe* ½-¾ in. long, globose or obovoid, 1-celled, 1-seeded, with a very thin crustaceous stone.

Dehra Dun, Rohilkhand, Oudh, Gorakhpur. DISTRIB.: Sub-Himalayan tract westward to the Jumna, Bengal, C. and S. India to Ceylon, also in Burma. Flowers in March and April, and the fruit ripens during the rainy season. The fruit is eaten, and the branches are lopped for fodder.

5. **Z. Xylopyrus,** *Willd. Sp. Pl. i, 1104; Roxb. Fl. Ind. i, 611; W. & A. Prod. 162; D. & G. Bomb. Fl. 49; Brand. For. Fl. 90; F. B. I. i, 634.* Z. Caracutta, *Buch.-Ham.; Roxb. l. c. 612.* Z. elliptica, *Roxb. l. c. 610.* Z. *Bunder, Royle Ill. 169? (name only).* Vern. *Kathber, ghunt, bhander.*

A large straggling deciduous shrub or small tree. Young branches, inflorescence, and under side of leaves softly tomentose. *Prickles* usually in pairs, the one straight and the other hooked and recurved, often wanting. *Leaves* 1-3½ in. long, broadly elliptic, obovate or orbicular, obliquely rounded or subcordate at the base, obtuse or acute, serrulate, dark green and nearly glabrous on the upper surface. *Flowers* in axillary compact shortly peduncled cymes, sometimes 4-merous. *Calyx* glabrous inside. *Petals* reflexed. *Disk* thin, 5-angled. *Ovary* usually 3-celled: *styles* 3, free almost to the base. *Drupe* globose, ½-1 in. in diam. 3-celled, 3-seeded, dry and hard, grey-tomentose when young.

Dehra Dun and Saharanpur forests, Rohilkhand, Oudh and Bundelkhand. DISTRIB.: Sub-Himalayan tract westward to the Jumna; Rájputána, Behar, Central Provinces, and south to Ceylon. The flowers appear in April and May, and the fruit ripens during the cold season. The bark is used as a tanning agent in company with the leaves of *Woodfordia floribunda*. The fruit is not edible, but the kernels are sometimes eaten. The young shoots and leaves are given to cattle and goats. The bark and charred fruit are used to give a black dye to leather.

3. BERCHEMIA, Neck.; Fl. Brit. Ind. i, 637.

Shrubs with unarmed often scandent branches. *Leaves* alternate, penninerved; *nerves* straight, parallel. *Flowers* hermaphrodite, polygamous, in axillary or terminal fascicles, or in terminal panicles, usually 5-merous. *Disk* lining the calyx-tube, margins free. *Ovary* sunk in the disk, but free from it, 2-celled, narrowed into the bifid style. *Fruit* a hard or fleshy ovoid or cylindrical drupe, girt at the base with the calyx-tube, 2-celled, 2-seeded. *Seed* linear-oblong, albumen fleshy.—Species about 10, found in the tropics of Asia, Africa and America.

B. floribunda, *Wall. Cat. 4256; Brand. For. Fl. 91; F. B. I. i, 637; Watt E. D. B. laxa, Wall.; Royle Ill. 169.*

A large erect or climbing shrub, or a small tree. *Branches* glabrous, glaucous when young. *Leaves* 2-4 in. long, ovate or oblong, acute or acuminate; *petiole* ¼-1 in; *stipules* intra-axillary, bifid. *Flowers* about 6 in a fascicle, fascicles arranged in large terminal racemose panicles. *Calyx*-lobes lanceolate, acute. *Petals* spathulate. *Fruit* about ½ in. long, cylindrical, purple.

Dehra Dun and Siwalik range, often in swampy ground. DISTRIB.: Trop. Himalaya from the Jhelam to Sikkim, Eastern Bengal and Khasia Hills. Flowers May-July.

4. RHAMNUS, Linn.; Fl. Brit. Ind. i, 638.

Shrubs or trees, with sometimes spinescent branchlets. *Leaves* alternate or fascicled, penninerved. *Flowers* in axillary clusters, or in simple or compound racemes, bisexual or polygamous. *Calyx* 4-5-fid, tube urceolate, lobes keeled within. *Petals* 4-5, or 0. *Stamens* 4-5. *Disk* thin, lining the calyx-tube. *Ovary* free, 3-4-celled, narrowed into a 3-4-cleft style. *Fruit* a berry-like drupe, girt at the base by the small calyx-tube, 2-4-celled, 2-4-seeded. *Albumen* fleshy.—Species about 70, distributed over the hot and temperate regions of both hemispheres.

Armed with spines, flowers 4-merous.	
Leaves coriaceous, alternate or fascicled	1. *R. persica.*
Leaves membranous, sub-opposite or fascicled	2. *R. virgata.*
Unarmed, flowers 5-merous	3. *R. triquetra.*

1. R. persica, *Boiss. Diagn. Ser. I, ii, 4; Fl. Or. ii, 17; Brand. For. Fl. 93; F. B. I. i, 638;* Watt *E. D.* Vern. *Chirla* (Dehra Dun).

A shrub or small tree, usually spinescent. *Leaves* shortly stalked, alternate, ½-2 in. long, fascicled at the ends of the branchlets, ovate

obovate or oblong, entire or serrate, tomentose beneath. *Flowers* few, fascicled in the leaf axils, shortly pedicelled, 4-merous. *Petals* small, linear. *Drupe* obovoid-globose, ¼ in. long, 2-4-celled, 1 or 2 of the cells often abortive.

Dehra Dun, scarce. DISTRIB.: Punjab, on the Sulaimán and Salt ranges, Tropical W. Himalaya eastward to Garhwal, up to 5,000 ft., and in W. Tibet up to 14,000 ft.; also in Baluchistán, Afghanistán and Persia. Flowers March to May. Leafless for several months The small black sweetish fruit is used medicinally. This species is closely allied to *R. oleoides*, a native of S. Europe and N. Africa.

2. R. virgata, *Roxb. Fl. Ind. i, 639; Royle Ill. 169.* R. dahurica, *Pall., Reise iii, 721 (dauurica); F. B. I. i, 604; Watt E. D.*

A shrub or small tree with many long straight branches forming a dense crown. *Branchlets* generally spinescent. *Leaves* sub-opposite or fascicled on congested branchlets, 1-1½ in. long, variable in shape from ovate or obovate to lanceolate, narrowed into a petiole ¼-⅛ in. long, glabrous; lateral nerves 3-6, arcuate. *Flowers* greenish, 4-merous, crowded in the axils of fascicled leaves, or at the base of branchlets. *Petals* minute, linear or spathulate. *Style* filiform, 2-4-cleft, branches recurved. *Drupe* 2-3-celled, obovate-orbicular, ¼ in. long. *Seeds* grooved.

Dehra Dun. DISTRIB.: Punjab at Peshawar, Temp. Himalaya up to 9,500 ft., Ghats of S. India (var. *hirsutus* of W. & A.); also in China and Japan. Flowers April to June. The bitter emetic and purgative fruit is used medicinally. Closely allied to the European *R. catharticus*, to which Aitchison's Kurram Valley specimens, named by him 'R. dahuricus,' have been referred by Boissier.

3. R. triquetra, *Brand. For. Fl. 92;* R. triqueter, *Laws. in F. B. I. i., 639; Watt E. D.* Ceanothus triquetrus, *Wall. in Roxb. Fl. Ind.* (ed. *Carey*) *ii, 376; Royle Ill. 169.* Vern. *Gaunt* (Dehra Dun).

An unarmed deciduous shrub or small tree. *Bark* scabrous with elevated specks. Young branches tomentose. *Leaves* 3-6 in. long, ovate-oblong, acuminate, serrate, usually yellow, glabrescent above, finely pubescent beneath; lateral nerves prominent, parallel, nearly straight; *petioles* about ¼ in. long. *Flowers* 5-merous, in sessile cymes forming interrupted racemes, often with foliaceous bracts. *Calyx*-lobes triangular. *Petals* clawed, emarginate, sheathing the stamens. *Style* 3-4-cleft, branches cohering. *Drupe* ¼ in., 3-lobed. Seeds grooved on the back.

Dehra Dun and Siwalik range. DISTRIB.: Punjab, on the Salt range, W. Himalaya from the Jhelam eastward to Kumaon, up to 6,000 ft. Flowers in July and August. The yellowish-coloured wood is hard and close-grained.

5. SAGERETIA. Brongn.; Fl. Brit. Ind. i. 641.

Unarmed or spinous shrubs, with slender subscandent or rigid opposite or subopposite branches. *Leaves* subopposite, penninerved, nerves arched. *Flowers* very small, sessile on the terminal leafless

paniculate branches. *Calyx* 5-fid, tube hemispherical. *Lobes* acute, keeled within. *Petals* 5, clawed, hooded. *Stamens* 5, equalling the petals. *Disk* cup-shaped, lining the calyx-tube; margin free, 5-lobed. *Ovary* sunk in the disk, but free from it, 3-celled; *style* short, 3-grooved; *stigmas* 3, capitate. *Drupe* globose, 3-celled, 3-seeded, coriaceous, indehiscent.—Species about 10, natives of Central and Eastern Asia, Java and the hotter parts of N. America.

S. oppositifolia, *Brongn. in Ann. Sc. Nat. Sér. I, X, 360; Royle Ill. 169; Brand. For. Fl. 95; F. B. I. i, 641; Watt E. D.* Vern. *Gonta* (Dehra Dun).

A large often climbing shrub or small tree, armed with short spinescent branchlets. *Leaves* opposite, 2-4 in. long, ovate-lanceolate, acute or acuminate, serrate, coriaceous, glabrous and dark green above, densely tomentose beneath when young; lateral nerves 4-8 pairs, arched; petiole ¼ in. *Flowers* very small, in large terminal panicles composed of lateral racemes. *Bracts* frequently leaflike. *Drupe* ¼ in. long, turbinate, not lobed, black when ripe.

Dehra Dun and Siwalik range. DISTRIB.: Subtrop. Himalaya from near Peshawar to Bhután, up to 6,000 ft., S. India, Java. Flowers from July to Sep. The small black sweetish fruit is eaten. The wood is hard and close-grained.

6. GOUANIA, Linn.; Fl. Brit. Ind. i. 643.

Unarmed climbing shrubs. *Leaves* alternate. *Flowers* polygamous, in axillary or terminal racemes; rachis often cirrhose. *Calyx* superior, 5-fid; tube short, obconic. *Petals* 5, inserted below the margin of the disk, hooded. *Stamens* 5, enfolded by the petals. *Disk* filling the calyx-tube, 5-angled or stellate. *Ovary* sunk in the disk, 3-celled, style 3-cleft. *Fruit* inferior, coriaceous, crowned by the persistent limb of the calyx, 3-winged.—Species 30-40, mostly natives of America, a few in Africa and Asia, and one in the Pacific Islands.

G. leptostachya, *DC. Prod. ii, 40; W. & A. Prod. 166; Royle Ill. 168; D. & G. Bomb. Fl. 50; Brand. For. Fl. 574; F.B. I. i, 643.*

An unarmed climbing shrub with tendrils at the ends of the glabrous branches. *Leaves* 2-4 in. long, ovate, acuminate, subcordate at the base, crenate, subcoriaceous, rusty-pubescent beneath when young; lateral nerves 5-6 pairs, arched. *Flowers* greenish, shortly pedicelled: *bracteoles* conspicuous, subulate. *Fruit* ½ in. across, broadly winged, separating into 3 coriaceous indehiscent carpels.

Dehra Dun. DISTRIB.: Trop. Himalaya, from Garhwál to Assam and the Khasia Hills, up to 4,000 ft.; Bengal, Burma, Malay Penins.; also in Java and the Philippines. Flowers in Aug. and Sep.

7. **HELINUS**, E. Meyer; Fl. Brit. Ind. i. 644.

Unarmed scandent cirrhose shrubs with slender angular branches. *Leaves* alternate, entire. *Flowers* umbellate, on long slender peduncles. *Calyx* superior, tube broadly obconic. *Petals* 5, inserted upon the margin of the disk, hooded. *Stamens* 5, equalling the petals. *Disk* epigynous, filling the calyx-tube. *Ovary* 3-celled; *style* short, 3-cleft; *stigmas* recurved. *Fruit* inferior, obovoid-globose, 3-celled, not winged. *Cells* 1-seeded, coriaceous, tardily dehiscing.—Species 4, one Indian, two in Trop. Africa and one in Madagascar.

H. lanceolatus, *Brand. For. Fl. 574; F.B. I. i*, 644, Gouania lanceolata, *Wall.; Royle Ill. 168.*

A slender twining shrub, glabrous, or the young parts and flowers pubescent. *Branchlets* ending in short simple tendrils. *Leaves* 1-1¾ in. long, ovate to ovate-lanceolate, acute, rounded or subcordate at the base, glabrous or canescent beneath. *Flowers* in umbels, pale yellow, about ⅛ in. across, each umbel subtended by a bract; *peduncles* ½-1 in. long. Margin of disk free. *Fruit* ¼ to ½ in. in diam.

Dehra Dun, Siwalik range, N. Oudh. DISTRIB.: Punjab, Trop. Himalaya from Kashmir to Kumaon, up to 4,000 ft., Parasnáth. In flower and fruit during the greater part of the year.

XXXVII.—AMPELIDEÆ.

SHRUBS or perennial herbs, usually climbing by means of tendrils. *Leaves* alternate, stipulate, simple or digitately compound. *Peduncles* often transformed into simple or compound tendrils. *Flowers* regular, rarely 1-sexual. *Calyx* cup-shaped; limb entire or obscurely 4-5-lobed. *Petals* 4 or 5, distinct or cohering, valvate, usually caducous. *Stamens* 4 or 5, inserted opposite the petals, free or connate into a tube adnate to the petals. *Disk* large, cupular or annular (adnate to the petals in *Leea*). *Ovary* free or somewhat adnate to the disk, 2-celled with 2 collateral ovules (*Vitis*), or 6-celled with 1 ovule in each cell (*Leea*). *Fruit* a berry. *Embryo* small, at the base of cartilaginous albumen.—Species over 400, inhabiting the tropical and temperate regions of the whole world.

Woody or herbaceous climbers; stamens distinct, free, ovary 2-celled	1. VITIS.
Erect shrubs or large herbs, stamens connate into a tube and adnate to the petals, ovary 3-6-celled	2. LEEA.

1. VITIS. Linn. (including Cissus, L.); Fl. Brit. Ind. i. 645.

Sarmentose shrubs, climbing usually by means of leaf-opposed tendrils. *Leaves* simple, or digitately or pedately 3-9-foliolate, rarely pinnate *Flowers* in umbellate, paniculate, racemose or spicate cymes, usually without bracts, sometimes polygamous. *Calyx* short, entire or 4-5-toothed or-lobed. *Petals* 4-5, free or cohering at the apex. *Stamens* 4-5, inserted below the margin of the disk; *anthers* free. *Ovary* usually 2-celled; *style* short or 0; *ovules* 2 in each cell. *Berry* ovoid or subglobose, 1-2-celled, cells 1-2-seeded.—Species about 375, chiefly in tropical and subtropical Asia, Africa and Polynesia, more rarely in America.

The species enumerated below as occurring within the area of this flora, fall into four sections, which, with five others, have been raised to the rank of genera by Planchon in his important work on the *Ampelideæ*, published in Vol. V of DeCandolle's Monographiæ Phanerogamarum (1883).

Petals 5, cohering in a calyptra, leaves simple. (VITIS).
- Leaves glabrous, inflorescence bifurcate . 1. *V. parvifolia.*
- Under surface of leaves with grey deciduous tomentum, inflorescence not bifurcate . 2. *V. vinifera.*

Petals 5, distinct; leaves simple (AMPELOCISSUS).
- Leaves quite glabrous . . . . . 3 *V. latifolia.*
- Leaves densely rufous tomentose beneath . 4. *V. rugosa.*
- Leaves rufous-woolly on the prominent veins beneath . . . . . 5. *V. indica.*

Petals 4, distinct.

Style short, stigma dilated, 4-lobed; leaves 3-5-foliolate (TETRASTIGMA).
- Flowers unisexual; leaves 3, pedately 5-foliolate. . . . . 6. *V. lanceolaria.*
- Flowers 2-sexual, leaves pedately 5-foliolate 7. *V. capriolata.*

Style subulate, stigma minute. (CISSUS).

Leaves simple.

Leaves glabrous or sparingly pubescent.
- Berry pyriform . . . . . 8. *V. repanda.*
- Berry fusiform . . . . . 9. *V. rosea.*

Leaves rusty-tomentose beneath . . 10. *V. adnata.*

Leaves 3-foliolate . . . . . 11. *V. trifolia.*

[1] **V. parvifolia**, *Roxb. Fl. Ind. i, 662; Royle Ill. 145; Brand. For. Fl. 99; F. B. I. i, 652; King in Journ. As. Soc. Beng. LXV, pt. ii, 111; Watt E. D.*

V. flexuosa, *Thunb. forma* parvifolia, *Planchon in DC. Mon. Phaner. V. 348.*

A slender vine with glabrous branchlets. *Tendrils* bifid. *Leaves* 2-4 in., long, ovate, acute or acuminate, sharply and deeply serrate, often 3-lobed; base cordate or truncate. *Inflorescence* leaf-opposed, 2-furcate, consisting of two divaricating thyrses springing from the apex of a common peduncle, much shorter than the leaves. *Flowers* umbellate, minute, green, 5-merous, long pedicelled. *Petals* cohering at the apex. *Style* very short. *Berry* round, black.

Dehra Dun (Falconer, King). DISTRIB.: W. Himalaya from Kashmir to Nepal, up to 6,000 ft.; also in E. Bengal. Flowers in April and May, and the fruit ripens during the rainy season. Very similar indeed to the var. *glabra* of *V. lanata*, Roxb. (see F. B. I. i, 651), and perhaps not specifically distinct, but in *V. parvifolia* the leaves are usually 3-lobed and the inflorescence is much smaller and shorter, and it is altogether a much more glabrous plant. Dr. Watt describes the fruit as being very sweet and delicately flavoured, and gives to it the name of the 'Himalayan wild vine.' He suggests that many of the small black grapes, sold at hill stations in India, may be derived as cultivated hybrids between the small-fruiting *V. parvifolia* and the larger-fruiting *V. rugosa*.

2. **V. vinifera**, *Linn. Sp. Pl. 202; W. & A. Prod. 130; Royle Ill. 146; Brand. For. Fl. 99; F. B. I. i, 652; DC. L'Orig. Pl. Cult. 15; Watt E. D.; Planchon in DC. Mon. Phaner. V 355.* Vern. *Angur.* (The grape vine.)

A large woody climber with bifid tendrils. *Leaves* glabrous above clothed beneath with grey deciduous tomentum, suborbicular, cordate more or less deeply 5-lobed, margin unequally cut into acute teeth. *Inflorescence* not bifurcate. *Flowers* 5-merous, green, on slender pedicels arranged in umbel-like cymes, which form large pyramidal compound panicles. *Bracts* caducous. *Petals* cohering above.

The grape-vine is cultivated in many gardens within the area, but the fruit rarely comes to perfection owing to the heavy rainfall which usually takes place before it has properly ripened. In Kashmir, however, and in other parts of the Western Himalaya, where the fruit ripens much later in the year, the cultivation of this plant might be undertaken with considerable profit. For a full account of the geographical distribution of the many cultivated varieties of this species the reader is referred to Planchon's Monograph of the *Ampelideæ* already alluded to. See also Dr. Watt's important Dictionary article.

3. **V. latifolia**, *Roxb. Hort. Beng. 18; Fl. Ind. i. 661; W. & A. Prod 130; Royle Ill. 144; Brand. For Fl. 99; F. B. I. i, 652; Watt E. D.* V. montana, *Laws. in F. B. I. . lc.* Ampelocissus latifolia, *Planch. in DC. Mon. Phaner. v, 370.* Vern. *Páni-bel, musal* (Merwára).

A large climber, quite glabrous except the young portions. *Stems* hollow, striate. *Leaves* long-petioled, 3-7 in. long, orbicular-cordate, 3-7-angled or -lobed; lobes dentate; basal nerves 5. *Peduncles* long, bifurcate, one of the branches consisting usually of a slender forked tendril

Flowers small, reddish-brown, in small compact thyrsoid cymes; *pedicels* often equalling the flowers. *Petals* 5, distinct. *Style* very short or O. *Berry* about the size of a currant, black, 2-seeded. *Seeds* elliptic, margins transversely rugose.

Dehra Dun and Siwalik range, chiefly in sál forests; also in Rohilkhand, Oudh, Merwára and Gwalior. DISTRIB.: Sub.-Himalayan tract from the Sutlej eastwards; also in Chota Nagpur, C. & S. India. Flowers May to July, and the fruit ripens after the rainy season. The berries are eaten. Royle mentions that the roots (*kusar*) are used medicinally.

4. V. rugosa, *Wall Cat. 5994; Brand. For. Fl. 99; King in Journ. As. Soc. Beng. LXV, pt. ii, 111* V. lanata, *Wall. (not of Roxb.)*; *W. & A. Prod. 131 (in part)*; *Royle Ill. 145*; *Dcne. in Jacquem. Voy. Bot. t. 36.* V. lanata, *var.* rugosa, *Laws. in F. B. I. i, 651*; *Watt E. D.* Ampelocissus rugosa, *Planch. in DC. Mon. Phaner., 376.*

A large climber with stout striated rusty-tomentose branches. *Leaves* 3-8 in. long, coriaceous, ovate or suborbicular, cordate, acuminate, the margin dentate and sometimes 5-angled, minutely rugose and floccose-pubescent above, with dense cinnamon-coloured tomentum beneath, basal auricles rounded, basal nerves 3-5. *Cymes* on long peduncles, subcorymbosely divided, usually bearing a stout tendril. *Petals* 5, spreading, caducous. *Berry* globose, larger than that of *V. parvifolia*.

Dehra Dun and along the base of the Himalaya eastward to Oudh. DISTRIB.: Abundant on the Outer Himalaya up to about 5,000 ft., creeping and climbing over rocks and trees. *Flowers* from April to June, and the fruit ripens during the rainy season. The fruit yielded by this plant is often sold at hill-stations as wild grapes. Dr. Watt mentions its peculiar flavour, which might be described as something between a black currant and a grape. See also his remarks under *V. parvifolia*. It is sometimes called *pahár-phuta* (the mountain-splitter).

5. V. indica, *Linn. Sp. Pl. 202; Roxb. Fl. Ind. i, 660; W. & A. Prod. 131; Brand. For. Fl. 100; F. B. I. i, 653; Watt E. D.*; *King in Journ. As. Soc. Beng. LXV, pt. ii, 112.* V. erioclada, *W. & A. Prod. 160*; *F. B. I. i, 651.* Ampelocissus Arnottiana, *Planch. in DC. Mon. Phaner. V, 386.* Vern. *Jangli-angur.* (Indian wild vine).

Stems stout, cylindrical, floccose-woolly. *Tendrils* simple, woolly. *Leaves* 3-6 in., broadly cordate-ovate, acute, with a narrow sinus and rounded basal lobes, coarsely glandular-dentate, hard, floccose or glabrous above, rufous- or grey-tomentose, on the veins beneath. *Flowers*, sessile, in dense clusters, surrounded with rufous wool, arranged on the thick woolly branches of a paniculate cyme. *Peduncle* 2-3 in., usually with a simple tendril at the base of the cyme. *Berry* globose, ¾ in. across, smooth, purple.

Merwára, Bundelkhand (Edgeworth). DISTRIB.: Central and S. India to Ceylon. The foliage and the bunches of small berries resemble those of the cultivated vine. Dr. Watt mentions that the plant is often protected on hedges for the sake of its fruit.

6. V. lanceolaria, *Wall. Cat. 6013 (in part.) ; W. & A. Prod. 128 ; Royle Ill. 145 ; Brand. For. Fl. 101 ; F. B. I. i, 660 (in part).* V. muricata, *W. & A. Prod. 128.* V. serratifolia, *W. & A. l. c. (not of Rottl.)* Cissus lanceolaria, *Roxb. Fl. Ind. i, 412 ; Royle Ill. 145.* C. muricata, *D. & G. Bomb. Fl. 40.* Tetrastigma lanceolarium, *Planchon in DC. Mon. Phaner. V, 423.*

A large evergreen climber, glabrous except the inflorescence. *Branches* cylindrical, woody, with rough often muricated bark. *Tendrils* leaf-opposed, simple. *Leaves* 3-pedately 5-foliolate, fleshy or coriaceous ; *leaflets* 3-5 in. long, stalked, oblong-lanceolate, acuminate, distantly serrate. *Flowers* 1-sexual, 4-merous, in short compact axillary cymes, pale yellow. *Style* short ; *stigma* peltate, 4-lobed. *Berry* the size of a small cherry, subpyriform or almost globose.

Forests of Oudh (Brandis). DISTRIB. : Chota Nagpur, Assam, S. India, Ceylon ; also in Burma and in the Malay Peninsula.

7. V. capriolata, *Don. Prod. Fl. Nep. 168 ; Brand. For. Fl. 101 ; F. B. I. i, 658.* Cissus capriolata, *Royle Ill. 149, t. 26, f. 2.* C. serrulatus, *Roxb. Fl. Ind. i, 414.* C. napaulensis, *DC. ; Royle Ill. 145.* Tetrastigma serrulatum *Planch. in DC. Mon. Phan. V, 432.*

A slender glabrous climber with wiry stems. *Tendrils* slender, simple or forked. *Leaves* pedately 5-foliolate, on petioles 1½-2½ in. long ; *leaflets* 1½-3 in. long, obovate to lanceolate, the lateral more or less oblique, acute or subacuminate, serrate or crenate-denticulate, with bristles in the notches, often cuneate at the base ; *stipules* scarious. *Cymes* axillary or terminating short lateral branches, peduncled. *Peduncles* usually with several scarious conspicuous bracts. *Flowers* 4-merous, pedicelled, in umbelliform clusters. *Stigma* sessile, large, flat. *Berry* about the size of a currant, globose, 2-4-seeded, black.

Dehra Dun. DISTRIB. : Abundant up to 7,000 ft. on the Himalaya, from the Jumna to Sikkim and Bhutan, also on the Khasia Hills and in Chittagong. A very ornamental plant clinging like ivy to the trunks of trees. Flowers during the rainy season.

8. V. repanda, *W. & A. Prod. 125 ; F. B. I. i, 648 (excl. syn. Cissus vitiginea, L. & C. rosea, Royle) ; King in Journ. As. Soc. Beng. LXV. pt. ii, 110.* Cissus repanda, *Vahl ; D. & G. Bomb. Fl. 39 ; Planch. in DC. Mon. Phan. V, 474.*

A large trailing or climbing vine. *Branches* terete, brittle, clothed with reddish wool when young *Tendrils* deciduous. *Leaves* simple, 3-6 in., broader than long, ovate, cordate, abruptly acuminate ; margin crenate-repand or serrate, rusty-tomentose beneath when young, at length glabrous. *Cymes* peduncled ; *bracts* and *bracteoles* densely woolly. *Flowers* in umbel-like clusters, pedicelled. *Petals* 4, triangular-oblong, ultimately separating from the apex, creamy-white. *Berry* pyriform, ½-in. long, 1-seeded, tipped by the mucronate style.

Dehra Dun and Siwalik range, Rohilkhand, Merwára. DISTRIB. : W. Himalaya from the Jumna eastwards, at low elevations, Bengal, Assam, Sylhet, S. India, Ceylon. Flowers in May and June.

9. V. rosea, *Royle Ill. 149, t. 26, f. 1 (Cissus); Brand. For. Fl. 100; Planch. in DC. Mon. Phan. V, 475.*

Scandent, with terete striate branches, the younger ones clothed with appressed rufous pubescence, becoming more or less glabrous. *Leaves* large, long-petioled, rounded or somewhat 3-lobed, cordate, acuminate; margin unequally serrate-dentate, 5-nerved, laxly pilose; *petioles* pilose; *stipules* ovate-oblong, villous. *Cymes* peduncled, branches 3-chotomous. *Flowers* densely subumbelled; *pedicels* clothed with reddish pubescence; *bracts* hairy. *Petals* 4, distinct, ovate from a broad base, pale pink. *Berry* fusiform, 1-4-seeded.

Mohand Pass on the Siwalik range (Royle), and in similar situations at the foot of the Himalaya DISTRIB. Garhwál (Falconer No. 352). N. Kanara (Talbot No. 1177). Very near *V. repanda*, but the leaves are much larger and not so broad in proportion; it also differs by its pink flowers and differently shaped berry. A fragmentary specimen in the Saharanpur herbarium collected by Falconer in the Kheree Ghat (Mohand Pass) shows the characteristic leaves and the fusiform berry. The writer has seen no living specimens.

10. V. adnata, *Wall. Cat. 5993 (in part); W. & A. Prod. 126; Royle Ill. 144; Brand. For. Fl. 100; F. B. I. i, 649; Watt E. D.; King in Journ. As. Soc. Beng. LXV, pt. ii, 110.* Cissus adnata, *Roxb. Fl. Ind. i, 405; Planch. in DC., Mon. Phan. V. 494.* C. latifolia, *Vahl; D. & G. Bomb; Fl. 39.*

A large woody climber, with slender sulcate branches, the young shoots 4-angled. Petioles, inflorescence and under surface of leaves clothed with rufous tomentum. *Leaves* 2-5 in. long, on stout tomentose petioles, ovate-cordate, often oblique, abruptly acuminate or cuspidate, bristly serrate, sometimes almost 3-lobed; *stipules* membranous, rounded, caducous. *Tendrils* slender, forked, woolly. *Cymes* peduncled, much divided; *bracteoles* small, soon falling. *Flowers* small, pedicelled, in dense umbels. *Petals* 4, triangular-ovate, usually distinct. *Style* equalling the ovary. *Berry* about the size of a pea, obovoid, smooth, black when ripe, 1-rarely 2-seeded. *Seeds* rugose.

Dehra Dun and forests of Oudh. DISTRIB.: From the W. Himalaya, at low elevations, to Bengal, Assam, Burma and in the Malay Penins.; also in S. India and Ceylon, extending to Java, Borneo and the Philippines.

11. V. trifolia, *Linn. Sp. Pl. 203;* V. carnosa, *Wall. Cat. 6018; W. & A. Prod. 127; Royle Ill. 144; Brand. For. Fl. 101; F. B. I. i, 654; Watt E. D.* Cissus carnosa, *Lamk.; Roxb. Fl. Ind. i, 409; D. & G. Bomb. Fl. 40.* Vern. *Amal-bel.*

A slender climber with angular branches. Young parts usually clothed with grey pubescence. *Leaves* 3-foliolate, petioled; *leaflets* 1-3 in. long, shortly stalked, broadly ovate or ovate-lanceolate or obovate, obtuse or acute, fleshy or submembranous, crenate or incise-dentate; *stipules* oblong. *Tendrils* slender, wiry, usually branched. *Cymes* usually axillary, often longer than the leaves, 3-5-rayed, with many divaricating cymose branches. *Flowers* greenish-white, shortly stalked. *Petals* 4, distinct. *Style* conspicuous. *Berry* obovoid-globose, 3-4-seeded. *Seed* trigonous, rugose.

Common throughout the drier parts of the area, and often growing in hedges. DISTRIB.: Tropical Himalaya and hotter parts of India, extending to Ceylon, Burma and the Malay Penins. Flowers during the rainy season. The leaves of this plant are often used in the form of a poultice in the treatment of boils.

2. LEEA. Linn. ; Fl. Brit. Ind. i. 664

Herbs or shrubs, rarely small trees. *Branches* striate or sulcate, often herbaceous. *Leaves* alternate, usually very large, simple or 1-2-3- pinnate ; *petiole* dilated at the base into sheathing stipules. *Peduncles* opposite the leaves. *Tendrils 0*. *Inflorescence* corymbosely cymose. *Flowers* red, yellow or green. *Calyx* 5-toothed. *Petals* 5, connate at the base and adhering to the 5-toothed staminal tube: revolute. *Filaments* inserted between the lobes of the tube. *Ovary* inserted on the disk, 3-6-celled ; *style* short ; *stigma* swollen ; *ovules* solitary in each cell, erect. *Berry* 3-6-celled and -seeded, subglobose, flattened at the top. *Pyrenes* wedge-shaped.—Species about 50, mostly in tropical Asia and Africa, a few Australian.

Petals red, leaves simply pinnate . . .	1. *L. alata.*
Petals greenish-white.	
Herbaceous, leaves simple . . .	2. *L. macrophylla.*
Shrubs, leaves 1-3-pinnate.	
Leaves simply pinnate or the lower ones bipinnate ; leaflets scabrous above, primary nerves close and parallel .	3. *L. aspera.*
Leaves 2-3-pinnate, glabrous on both surfaces, primary nerves of leaflets distant	4. *L. sambucina.*
Leaves 2-pinnate, hairy beneath ; primary nerves of leaflets distant . . .	5. *L. bracteata.*

1. L. alata. *Edgew. in Trans. Linn. Soc. XX (1846), 36 ; F. B. I. i, 665 ; Brand. For. Fl. 102 ; Clarke in Trimen's Journ. Bot. (1881), 101.* L. rubra, *Royle Ill. 145 (not of Blume).*

A stiff shrub, 2-5 ft. high, glabrous or nearly so. *Leaves* simply pinnate ; *leaflets* of the upper leaves 5-9, 10 by 2½ in., oblong, shortly acute, rounded or rhomboid, sessile or nearly so, glabrous or minutely puberulous on the nerves beneath ; primary nerves 8-12 on each side of the midrib ; secondary nerves numerous, subparallel, conspicuous ; *stipules* large, rounded, deciduous. *Peduncles* 3-8 in., stout. *Corymb* dense, reddish, hardly pubescent ; *bracts* and *bracteoles* none. *Petals* red. Lobes of the *staminal tube* ovate-oblong, emarginate. *Berries* ¼-⅓ in. in diam., with 4-6 pyrenes.

Dehra Dun, Rohilkhand, N. Oudh. DISTRIB.: Outer Himalaya and from Sirmur eastwards, Sikkim Terai. Flowers during June and July.

2. L. macrophylla. *Roxb. ex Hornem. Hort. Hafn. i, 231 (not of DC.); Roxb. Hort. Beng. 18; Fl. Ind. (ed. Wall.) ii, 466; D. & G. Bomb. Fl. 41; Brand. For. Fl. 102; F. B. I. i, 654 (in part); Clarke in Trimen's Journ. Bot. (1881), 137.*

Herbaceous, 1-3 ft. high. *Leaves* simple, large, the lower ones sometimes up to 2 ft. in diam.; upper 6-9 in., ovate, cordate, acute, mealy-white beneath; margin toothed, often irregularly; primary nerves of upper leaves 8-10 on each side of midrib; *petioles* often 2-5 in; *stipules* very large, subpersistent. *Corymbs* sessile, mealy-pubescent. Lobes of the *staminal tube* entire or slightly emarginate. *Berry* ¼-⅓ in. in diam., 4-6-celled, black.

Dehra Dun, Terai tracts of Rohilkhand and Oudh. DISTRIB.: Scattered throughout the hotter parts of India: frequent in Lower Burma. Flowers during the rainy season. The root yields a dye, and is also used medicinally.

3. L. aspera. *Edgew. in Trans. Linn. Soc. XX (1846), 36; Brand. For. Fl. 102; F. B. I. i, 665 (not of Wall. or Kurz); Clarke in Trimen's Journ. Bot. (1881), 136; Watt E. D.* Vern. *kumála.*

A stout spreading shrub, 6-12 ft. high. Uppermost *leaves* usually simply pinnate, or with the lower pinnæ 3-foliolate; lower *leaves* bipinnate; *petioles* and *rhachises* round or scarcely winged. *Leaflets* 3-6 in. long, cordate, elliptic, not parallel-sided, acuminate, more or less rough on the upper surface: margins crenate; primary nerves many, close together and parallel, bifurcating near the edge. *Berries* becoming black when ripe.

Dehra Dun, in ravines, and in N. Oudh. DISTRIB.: W. Himalaya from Kumaon to Kashmir, up to 7,000 ft.; also in Chota Nagpur, Bombay, and in C. and S. India. Flowers June and July. The black succulent fruit is eaten.

L. sambucina. *Willd. Sp. Pl. i, 1177; Roxb. Fl. Ind. (ed. Wall.) ii, 470; Brand. For. Fl. 102; F.B.I. i, 666 (in part); Clarke in Trimen's Journ. Bot. 1881, 139; Watt E. D.* L. Staphylea, *Roxb.; Fl. Ind. (ed. Wall.) ii, 471; W. & A. Prod. 132; D. & G. Bomb. Fl. 41.*

A stiff branching shrub, 4-10 ft. high. *Leaves* 2- or 3-pinnate. *Leaflets* about 4 in long, elliptic, acuminate, rhomboid or rounded at the base, glabrous; primary nerves about 12 on each side of the midrib, curving towards the margin of the leaf; secondary nerves indistinct; *stipules* caducous. *Flowers* greenish, in dense rigid subsessile glabrous or minutely pubescent corymbs; *bracts* and *bracteoles* inconspicuous, caducous. *Staminal*-tube yellowish-white, its lobes notched. *Berry* ¼-⅓ in. in diam.; pyrenes 4-6.

Forests of N. Oudh. DISTRIB.: Outer Himalaya from Garhwál to Assam, up to 4,000 ft.; abundant in Bengal; scarce in Malaya; also reported from the Malay Islands, China, the Philippines and in N. Australia. Flowers during the rainy season. The root and leaves are used medicinally.

5. L. bracteata. *Clarke in Trimen's Journ. Bot. (1881), 164.* L. robusta, *Laws. in F.B.I. i, 667 (excl. all syn.); not of Roxb. nor of Blume.*

A large straggling shrub, 6-16 ft. high. *Leaves* 2-pinnate, or the upper simply pinnate; *leaflets* large, ovate-lanceolate, shortly caudate; hispidulous on the nerves beneath; primary nerves distant. *Corymbs* 4-6 in., dense. *Bracts* ovate or lanceolate, persistent. *Petals* green. Lobes of *staminal* tube subentire. *Berries* brownish-yellow when ripe.

Oudh Terai. (R. Thompson, and Duthie's collector,) DISTRIB.: Sikkim and Khasia Hills 500-4,000 ft., very common (C. B. Clarke). A very distinct species.

XXXVIII.—SAPINDACEÆ.

TREES or shrubs, rarely herbs. *Leaves* usually alternate and exstipulate, pinnate palmate 3-foliolate or simple. *Flowers* mostly polygamo-dicœcious and small, usually either irregular or unsymmetrical. *Sepals* usually 4-5, more or less connate, imbricate or valvate in bud. *Petals* free, 4-5, rarely fewer or 0, the position of the fifth sometimes vacant. *Disk* annular or unilateral. *Stamens* 5-10, inserted inside the disk at the base of the ovary or outside or on the disk, sometimes unilateral; *filaments* free, often hairy. *Ovary* centric or excentric, entire or lobed, 1-4 celled; *ovules* 1-2 in each cell, rarely more, attached to the axis. *Fruit* capsular or indehiscent, entire or lobed, sometimes winged. *Seeds* with or without albumen, sometimes arillate. Species 400 to 500, scattered over the whole world, and more abundantly within the tropics.

The *Lit-chi* (Nephelium Lit-chi) is cultivated in many gardens within the area. It has been introduced from S. China. *Æsculus Hippocastanum*, L. is the Common Horse-chestnut, a native of Persia and the Caucasus. The Himalayan Horse-chestnut (*Æ. indica*, *Colebr.*) is indigenous on the W. Himalaya and eastward to Nepal.

Stamens inserted inside the disk.
- Flowers irregular.
  - Leaves biternate. A climbing shrub. . 1. CARDIOSPERMUM.
  - Leaves odd-pinnate . . . . 2. ERIOGLOSSUM.
- Flowers regular.
  - Fruit syncarpous, indehiscent, petals 0. . 3. SCHLEICHERA.
  - Fruit of 1-3 distinct indehiscent cocci. . 4. SAPINDUS.

Stamens inserted on the disk, fruit 2-winged, indehiscent. . . . . 5. ACER.

Stamens inserted outside the disk; fruit 3-winged, dehiscent. An evergreen shrub . 6. DODONÆA.

1. CARDIOSPERMUM, Linn. ; Fl. Brit. Ind. i, 669.

Climbing herbs with wiry stems and branches. *Leaves* alternate, biternate, exstipulate ; *leaflets* coarsely dentate. *Racemes* axillary, lowest pair of pedicels developed into spiral tendrils. *Flowers* irregular, polygamo-dicœcious. *Sepals* 4, concave, the 2 outer ones smaller. *Petals* 4, in pairs, the 2 larger lateral ones usually adhering to the sepals, each with an emarginate scale above the base, the 2 smaller inferior and remote from the stamens, each furnished with a small crested scale. *Disk* unilateral, wavy, almost reduced to 2 round or linear glands opposite the lower petals. *Stamens* 8, excentric ; *filaments* free or connate, the 4 nearest to the glands shorter than the rest. *Ovary* 3-celled ; *style* short, 3-fid ; *ovules* solitary. *Capsule* 3-celled, 3-valved, inflated, loculicidal. *Seeds* globose, usually arillate at the base, exalbuminous.—Species about 14, mostly in Tropical America.

C. Halicacabum, *Linn. Sp. Pl. 366 ; Roxb. Fl., Ind., ii, 292 ; W. & A. Prod. 109 ; Royle Ill. 137 ; D. & G. Bomb. Fl. 34 ; F. B. I. i, 670 ; Watt, E. D.*

An annual or perennial nearly glabrous climbing herb. *Stem* slender, furrowed. *Leaves* 1½-3 in. long, deltoid or ovate ; *petioles* 2-3 in. long ; *leaflets* deeply cut, acuminate, glabrous, thin and flaccid. *Cymes* small, terminating a long stiff slender axillary peduncle, and provided beneath the cyme with 2 opposite circinate *tendrils*. *Flowers* very small, white. *Sepals* and *petals* rounded. *Capsule* ½-¾ in wide, depressed pyriform, trigonous, winged at the angles ; valves papery, veined, finely pubescent. *Seeds* globose, smooth, black ; aril heart-shaped, white.

Common within the area, climbing on hedges and over bushes. DISTRIB.: Over all the hotter parts of India and in Ceylon, ascending to 4,000 ft. on the W. Himalaya ; also in most other tropical and subtropical countries. Various portions of the plant are used medicinally and the leaves are sometimes cooked and eaten as a vegetable.

2. ERIOGLOSSUM, Blume ; Fl. Brit. Ind. i, 672.

Erect trees or shrubs. *Leaves* alternate, odd-pinnate, exstipulate. *Leaflets* opposite or sub-opposite, entire. *Panicles* terminal, erect, bearing the white irregular polygamo-dicœcious flowers on elongated branches. *Sepals* 5, unequal, orbicular, concave, broadly imbricated, the 2 outer ones smaller. *Petals* 4, unequal, obovate, clawed, the place of the 5th vacant ; scale hairy, hooded, with an apical lobed appendage. *Disk* one-sided, lobed. *Stamens* 8, more or less turned to one side ; *filaments* hairy. *Ovary* stalked, obcordate, 3-lobed, 3-celled ; *style* slender ; *stigma* obscurely 3-lobed ; *ovules* solitary in

each cell. *Fruit* lobed to the base; lobes oblong, indehiscent, diverging. *Seeds* exarillate, without albumen.—Species 2 or 3.

E. edule, *Bijdr. 229; F. B. I. i, 672; Watt E. D.* E. rubiginosum, *Brand. For. Fl. 108.* Sapindus rubiginosa, *Roxb.; Fl. Ind. ii, 232; W. & A. Prod. 112; D. & G. Bomb. Fl. Suppl. 14.*

A large tree or shrub, with the shoots, petioles and inflorescence rusty-pubescent. *Leaves* about 1-2 ft. long; *leaflets* 8-12, elliptic or ovate-oblong, often acuminate, 2½-7 in. long, oblique at the cuneate base, shortly stalked, glabrescent or sparingly puberulous on the upper surface, more or less tomentose beneath; main nerves 6-10 pairs. *Flowers* in small clusters on elongated spike-like racemes arranged in a panicle, shortly stalked, sweet-scented. *Fruit* ¼ in. long, glabrous.

Kheri dist. in N. Oudh, where it grows into a large tree. DISTRIB.: Bengal, Sikkim Himalaya, Assam, Burma to Penang; Malay Penins., S. India; also on the N. W. coast of Australia. The wood is strong and durable, and is chocolate-coloured in the centre.

3. SCHLEICHERA, Willd.; Fl. Brit. Ind. i, 681.

Trees. *Leaves* alternate, exstipulate, pinnate; *leaflets* entire. *Flowers* small, fascicled, regular, polygamo-dioecious. *Calyx* 4-6-cleft. *Petals* 0. *Disk* complete, glabrous, wavy. *Stamens* 5-8, inserted within the disk. *Ovary* ovoid, 3-4-celled, narrowed into a rigid style; *stigma* 3-4-cleft; *ovules* solitary in each cell, erect. *Fruit* dry, coriaceous, indehiscent, 1-3-celled. *Seeds* enclosed in a fleshy aril.—A small genus represented in India, the Indian Archipelago and in the Philippines.

S. trijuga, *Willd. Sp. Pl IV, 1096; Roxb. Fl. Ind. ii, 277; W. & A. Prod. 114; D. & G. Bomb. Fl. 35; Brand. For. Fl. 105, t. XX; F. B. I. i, 681; Watt E.D.* Melicocca trijuga, *Juss.; Royle Ill. 137.* Vern. *Gausam, kusam.*

A large handsome tree with paripinnate leaves. Young parts downy. *Leaflets* 2-4 pairs, opposite, 2-9 in. long, sessile or nearly so, oblong or elliptic-oblong, obtuse acute or acuminate, entire, the terminal pair the largest, coriaceous when old. *Racemes* axillary, often several on short branchlets. *Flowers* yellowish-green, male and 2-sexual often on different trees. *Stamens* much longer than the calyx. *Fruit* ½-1 in. long, pointed, smooth or echinate.

Debra Dun and Siwalik range, Oudh and Bundelkhand, in dry mixed forests. DISTRIB.: Foot of the W. Himalaya eastward from the Sutlej, Chota Nagpur, C. and S. India, Ceylon and Burma: also in Java and Timor. The old leaves become golden-yellow and are shed early in March, the flowers and crimson young foliage appearing soon afterwards. The fruit ripens during Oct. and Nov. It is cultivated in gardens and as a roadside tree. The wood is hard, strong and durable, and is much valued. A lac of superior quality is yielded by this tree. The oil obtained from the seeds

is used for burning and also medicinally, and the pulpy subacid aril is eaten. In Oudh, where the tree is plentiful, the foliage is much used as cattle fodder during the dry season.

4. SAPINDUS, Linn.; Fl. Brit. Ind. i, 682.

Trees or shrubs. *Leaves* alternate, or subverticillate (and then 1-foliolate), usually paripinnate, exstipulate; *leaflets* coriaceous, usually entire. *Flowers* regular, polygamous, in terminal or axillary panicles. *Sepals* 4-5, imbricate. *Petals* 4-5, with or without scales. *Disk* complete, annular, fleshy. *Stamens* usually 8-10, inserted within the disk; *filaments* usually pilose; *anthers* versatile. *Ovary* entire or 2-4-lobed, 2-4-celled; *style* terminal; *stigma* 2-4-lobed; *ovules* solitary in each cell. *Fruit* of 1-3 indehiscent cocci. *Seed* globose, with or without an aril.—Species about 40, inhabiting the tropical regions of the whole world.

Leaflets 4-6, usually opposite, disk and ovary hairy	1. *S. laurifolius.*
Leaflets 10-16, usually alternate, disk and ovary glabrous	2. *S. Mukorossi.*
Leaves 1-foliolate, disk and ovary glabrous	3. *S. Danura.*

1. S. laurifolius, *Vahl. Symb. iii, 54; Roxb. Fl. Ind. ii, 278; W. & A. Prod. 111; Royle Ill. 137; D. & G. Bomb. Fl. 34; Brand. For. Fl. 106.* S. trifoliatus, *F. B. I. i, 682* (not of *Linn.*); *Watt E. D.* S. emarginatus, *Vahl; Roxb. l.c. 279; W. & A. l.c.; Brand l.c. 107; D. & G. l.c. 35.* (Soap-nut tree of S. India.)

A large tree. *Leaves* abruptly pinnate; *leaflets* 4-6, those of the terminal pair longest, 3-7 in., elliptic or oblong, acuminate or emarginate, glabrous or pubescent beneath, base obtuse. *Flowers* in terminal pubescent panicles, white, hairy. *Sepals* obtuse. *Petals* narrower and longer than the sepals, sometimes with a membranous pilose scale attached to the claw. *Stamens* 8; *anthers* apiculate. *Disk* hairy. *Ovary* 3-lobed, rusty-tomentose. *Fruit* fleshy, ½-¾ in. long, 2-3-lobed, at length glaucescent.

Forests near Todgarh in Merwára (apparently quite wild), Bundelkhand (Vicary), Oudh (T. Anderson). DISTRIB.: Bengal, S. India and Ceylon. A handsome tree, often cultivated near villages. Flowers during the cold season, and the fruit ripens between Feb and April. The fruit is largely used as a substitute for soap. From the hard yellow wood a variety of small articles, such as combs, etc., are made. Trimen, in his Flora of Ceylon, Vol. I, p. 304, contends that *S. trifoliatus* of Linnæus, besides being an inappropriate name, refers to *Schleichera trijuga.*

2. S. Mukorossi. *Gærtn. Fruct, i, 342, t. 70; F. B. I. i, 683; Watt E. D.* S. detergens, *Roxb.; Fl. Ind. ii, 280* (*not of Wall.*); *Brand. For. Fl.*

107. S. acuminata, *Wall*; *Royle Ill. 139.* Vern. *Ritha* (Soap-nut tree of N. India).

A tree. *Leaves* pinnate, crowded near the ends of the branches; *leaflets* 10-16, shortly stalked, 2-6 in. long, lanceolate-oblong, alternate or sub-opposite, acuminate or obtuse, glabrous, base oblique, obtuse, rachis sometimes margined. *Flowers* in terminal and lateral obscurely tomentose panicles, white or purple, ciliated. *Petals* 5, with a woolly scale on each side at the top of the claw. *Disk* glabrous, flat, with 5 elevated radiating lines. *Ovary* 3-cornered, glabrous. *Fruit* ¾ in. in diam., sub-globose, fleshy, glaucescent, saponaceous.

Royle reported this tree (the form *acuminata*) as occurring wild in Dehra Dun and in valleys of the N.-W. Himalaya up to 4,000 ft. It is cultivated in many parts of N. W. India as far as the Chenab; also in Bengal. DISTRIB.: China and Japan. It flowers in May and June, and the ripe fruit is obtainable during the cold season. The fruit is largely used in India as a substitute for soap for washing clothes as well as the hair. It is also employed as a detergent in the washing of cloth prior to the dyeing of it. Large quantities of soap-nuts are exported annually from the Kumaon Forest division.

3. S. **Danura**, *Voigt Hort. Sub. Calc. 94; F. B. I. i, 684.* Scytalia Danura, *Roxb*; *Fl. Ind. ii, 274.* Sc. verticillata, *Roxb. l.c. 273.* Aphania Danura, *Radlk.*

An evergreen shrub or small tree. *Leaves* simple, 4-12 in. long, alternate or at the extremities of the branches subverticillate, obovate, elliptic or oblong, narrowed or shortly acuminate at the apex, narrowed to a rounded shortly petioled base. *Panicles* terminal, composed of rather remote diverging compound ramifications, puberulous. *Flowers* small, pale yellow tinged with pink. *Petals* 5, with a short woolly incurved scale at the base of each. *Stamens* 6-8, oblong, obtuse. *Disk* glabrous. *Ovary* 2-3-lobed, glabrous. *Fruit* of 1-3 cocci, ½-¾ in. long, pulpy when ripe, orange-coloured.

Rohilkhand (F. B. I.). DISTRIB.: Bengal, Assam, Sylhet, Chittagong, Nicobar Islands, Burma.

5. ACER, Tournef.; Fl. Brit. Ind. i, 692.

Trees with opposite, simple or palmately lobed exstipulate leaves. *Flowers* in terminal and lateral racemes or corymbs, regular, polygamous. *Calyx* usually 5-partite, imbricate, deciduous. *Petals* equal in number to the sepals or 0, erect, shortly clawed, without scales. *Stamens* about 8, inserted on the glabrous disk; *filaments* usually shorter in the bisexual flowers. *Ovary* usually 2-lobed and 2-celled, laterally compressed; *ovules* 2 in each cell; *style* bipartite, divisions linear, stigmatose on inner face. *Fruit* a double samara, indehiscent.—Species about 100, natives of Europe, Asia and N. America.

In the Flora of Brit. India 13 kinds of Maple are described, of which five (including the following) are found on the adjacent ranges of the W. Himalaya. The Sycamore or Plane-tree of Scotland belongs also to this genus.

A. oblongum, *Wall. ex DC. Prod. i, 593; Royle Ill. 134; Brand. For. Fl. 110; F. B. I. i, 693; Watt E. D.*

A moderate-sized evergreen tree. *Leaves* 2-6 in. long, undivided, oblong or ovate, acuminate, entire, glabrescent, penninerved, dark green above, silvery-glaucous beneath; base obtuse, 3-nerved, main lateral nerves 4-8 pairs; *petiole* ½-1 in. *Cymes* panicled, contemporary with the leaves, pubescent. *Sepals* and *petals* narrow. *Stamens* 8, longer in the male flowers, glabrous. *Ovary* hairy. *Fruit* glabrous. *Carpels* 1-1½ in. long; *wings* veined, diverging, contracted below; *back* nearly straight; *cells* clothed inside with white hairs.

Dehra Dun and Siwalik range. DISTRIB.: Temperate Himalaya up to 6,000 ft., from Kashmir to Sikkim, Bhutan and Mishmi Hills; also in Hongkong and Loochoo Island. The flowers appear Feb.-April, and the fruit ripens during the rains. The wood, which is of a pink or reddish-brown colour and close-grained, is used for agricultural implements, and drinking cups are sometimes made from it.

6. DODONÆA, Linn.; Fl. Brit. Ind. i, 697.

Shrubs, rarely trees, with alternate exstipulate leaves. *Flowers* polygamous, inconspicuous. *Sepals* 5 or fewer, imbricate or valvate. *Petals* 0. *Stamens* usually 8, inserted on the outer side of the disk; *filaments* short; *anthers* linear-oblong. *Disk* obsolete in the male flower, small in the female. *Ovary* 3-6-sided and -celled; *style* 3-6-sided, apex 3-6-cleft; *ovules* 2 in each cell. *Capsule* 2-6-sided, septicidally 2-6-valved; *valves* winged on the back; *cells* 1-2-seeded. *Seeds* exalbuminous, without an aril, funicle thickened. *Embryo* spirally involute.—Species 46, mostly Australian.

D. viscosa, *Jacq. Enum. Pl. Carib. 19; Brand. For. Fl. 113; F. B. I. i, 697; Watt E. D.* D. angustifolia, *Linn. f.; Roxb. Fl. Ind. ii, 256.* D. dioica. *Roxb.; Fl. Ind. l. c.* D. Burmanniana, *DC.; W. & A. Prod. 144; D. & G. Bomb. Fl. 36.* Vern. *Sanatta, walayati mendi.*

An evergreen shrub, or occasionally a small tree. *Leaves* undivided, subsessile, 1-5 in. long, glabrous and viscid-shining, oblanceolate, subapiculate, base cuneate-attenuate; margin revolute, entire or nearly so. *Flowers* small, in short terminal panicles with racemose branches. *Sepals* usually 5, oblong, about equalling the stamens, greenish-yellow. *Capsule* ½-1 in. broad, compressed, glabrous; wings broad, rounded, extending from the base to the style, viscid with resin. *Seeds* black.

Merwára (wild); cultivated in many other places wthin the area for hedges. DISTRIB.: Sindh, Punjab, W. Himalaya up to 4,000 ft., Chota

Nagpur, C. and S. India, Ceylon and Malay Penins.; also in Baluchistan, Afghanistan, Arabia, Africa, Trop. America, Java, China and Australia. Flowers Aug. to Feb. It makes excellent hedges when properly looked after. The hard close-grained wood is used for engraving, turning, etc.

XXXIX.—SABIACEÆ.

CLIMBING or erect shrubs, or trees. *Leaves* alternate, exstipulate, simple or compound. *Flowers* small, 2-sexual or polygamous, usually panicled. *Calyx* 4-5-partite, imbricate. *Petals* 4-5, sometimes unequal, imbricate. *Disk* usually small, annular. *Stamens* 4-5, opposite the petals, inserted at the base of or on the disk, all or 2 only perfect; *filaments* clavate. *Ovary* 2-3-celled, compressed or 2-3-lobed; *styles* 2-3, free or connate; *stigmas* punctiform; *ovules* 1-2 in each cell. Ripe *carpels* 1-2, dry or fleshy, indehiscent. *Seeds* compressed or globose, exalbuminous.—Species about 65, inhabiting tropical and temperate parts of the world.

Stamens 4-5, all perfect and equal . .	1. SABIA.
Stamens 5, very unequal	2. MELIOSMA

1. SABIA. Colebr.; Fl. Brit. Ind ii, 1.

Climbing or sarmentose shrubs. *Branches* with the bud-scales persistent at their base. *Leaves* quite entire. *Flowers* axillary, usually cymose or panicled, 2-bracteate; bracts, calyx, corolla, stamens and carpels all opposite. *Calyx* 4-5-partite. *Petals* 4-5, with transparent lines, green purplish or yellow. *Disk* annular, 4-5-lobed. *Stamens* 4-5, inserted at the base of the disk. *Carpels* 2, rarely 3; *styles* 2, erect, terminal; *ovules* 2 in each carpel, horizontal. Ripe *carpels*, 1 or 2, gibbous, with a subbasal style, dry or drupaceous. *Seed* reniform, embryo curved.—Species about 17, natives of India, China and Japan.

S. paniculata, *Edgew. ex Hook. f. & T. Fl. Ind. i, 211; Brand. For. Fl. 117; F. B. I. ii, 3.*

A glabrous climbing shrub. *Leaves* 3-7, in. long, elliptic or oblong-lanceolate, acute or acuminate, base rounded or acute, coriaceous, dark green and shining above, reticulate beneath; main nerves arched. *Flowers* yellow, in long pilose panicles. *Sepals* 1-nerved, densely hairy. *Petals* 3-5-nerved. *Stamens* included. *Drupe* orbicular, compressed.

Dehra Dun and eastwards along the base of the Himalaya. DISTRIB.: Subtropical Himalaya from Garhwál to Nepal, up to 3,000 ft. Flowers Feb. and March.

2. MELIOSMA, Blume; Fl. Brit. Ind. ii, 3.

Trees or shrubs, usually pubescent or tomentose. *Leaves* simple or odd-pinnate. *Flowers* in branched terminal or in terminal and axillary panicles, small, hermaphrodite; *bracts* caducous; *bracteoles* and *sepals* 5-9, persistent, forming an uninterrupted whorl round the much larger petals. *Petals* 5, 3 of them larger than the other two. *Stamens* 5; 2 fertile and opposite the smaller petals; *filaments* short, flattened, incurved, expanded at the top into a cup which bears 2 globose cells, that burst transversely, springing back elastically; the other 3 stamens deformed and opposite the larger petals. *Disk* cupular or annular, with 2-5 teeth. *Ovary* sessile, usually 2-celled; *ovules* 2 in each cell. *Drupes* small, oblique, subglobose; *stone* crustaceous, 1-celled. *Seed* globose, testa membranous.—Species about 40, inhabiting Tropical Asia, the Malay Archipelago and S. America.

M. simplicifolia. *Walp. Rep. i, 423; Brand. For. Fl. 116; F. B. I. ii, 5.* Millingtonia simplicifolia, *Roxb.*; *Fl. Ind. i, 103*; *W. & A. Prod. 115.*

A large tree with puberulous branchlets. Young parts rufous-pubescent. *Leaves* 6-16 in. long, obovate or oblanceolate, shortly acuminate, narrowed into the petiole, entire or obtusely toothed when young, membranous, glabrous or puberulous beneath, with distinct raised nerves; *petiole* ½-2 in., swollen at the base. *Flowers* small, nearly sessile, arranged in large lax spreading pubescent axillary and terminal panicles; *bracteoles* and *sepals* 5-6, ciliate, the outer ones setaceous, the inner broad and acute. *Drupe* ⅓-¼ in., globose, shining, purple.

Terai lands of the northern portion of the Bahraich district of Oudh (Duthie's collector). DISTRIB.: Trop. Himalaya from Nepal to Sikkim, up to 4,000 ft., E. Bengal, Burma, S. India and Ceylon.

XL.—ANACARDIACEÆ.

TREES or shrubs; juice often milky and acrid. *Leaves* usually alternate, exstipulate, simple or compound. *Inflorescence* various. *Flowers* small, regular, often 1-sexual or polygamous. *Calyx* 3-5-partite. *Petals* 3-5, alternate with the sepals, free, rarely 0. *Disk* usually annular, entire or lobed. *Stamens* as many as or twice the number of the petals, sometimes fewer, inserted usually under the disk. *Ovary* usually superior, 1- or 2-6-celled or (in *Buchanania*) of 5-6 free carpels; *styles* 1-4; *ovules* solitary in each cell, pendulous from the top or wall or from an ascending basal funicle. *Fruit* usually a 1-5-celled 1-5-seeded drupe. *Seed* exalbuminous.—Species about 450, chiefly tropical.

Carpels 5, distinct, only 1 becoming fertile; stamens 10; leaves simple . . . . . 1. BUCHANANIA.

Carpels combined into a 1-celled ovary, leaves simple or compound.

Styles 3-4.

Ovule suspended from a basal funicle.

Petals 4-6, leaves 3-foliolate . . 2. RHUS.

Petals 0, leaves pinnate . . 3. PISTACIA.

Ovule pendulous from near the top of the ovary.

Leaves odd-pinnate . . . 4. ODINA.

Leaves simple . . . . 5. SEMECARPUS.

Style single, lateral; only one fertile stamen, leaves simple . . 6. MANGIFERA.

Carpels combined into a 5-celled ovary, stamens 10, leaves odd-pinnate . . 7. SPONDIAS.

1. **Buchanania,** Roxb.; Fl. Brit. Ind. ii, 22.

Trees. *Leaves* alternate, petioled, simple, entire. *Panicles* terminal and axillary, crowded. *Flowers* small, white, hermaphrodite. *Calyx* short 3-5-cleft, persistent, imbricate. *Petals* 4-5, oblong, recurved, imbricate. *Disk* orbicular, 5-lobed. *Stamens* 8-10, free, inserted at the base of the disk. *Carpels* 5-6, free, seated in the cavity of the disk, one fertile, the rest imperfect; *style* short; *stigma* truncate; *ovule* 1, pendulous from a basal funicle. *Drupe* small, flesh scanty; *stone* crustaceous or bony, 2-valved. *Seed* gibbous, acute at one end.—Species about 20, in Trop. Asia, Australia and Polynesia.

B. latifolia, *Roxb. Hort. Beng. 32; Fl. Ind. ii, 395; W. & A. Prod. 169; Royle Ill. 174; D. & G. Bomb. Fl. 52; Brand. For. Fl. 127; F. B. I. ii, 23; Watt E. D.* Vern. *Piyál, khat-bhilâwa* (Dehra Dun).

A moderate-sized subdioecious tree with tessalated bark. *Leaves* 6-10 in. long, broadly oblong, rounded at the apex, coriaceous and hard, reticulate on both surfaces, usually pubescent beneath; lateral nerves 15-20 pairs, stout, nearly straight; *petiole* stout, pubescent. *Panicles* terminal and axillary, pyramidal, shorter than the leaves, woolly or velvety; *bracts* small, caducous. *Flowers* crowded, ¼ in. in diam., greenish-white. *Calyx* 5-toothed. *Petals* oblong. *Disk* fleshy. *Stamens* 10, spreading, equalling the petals. *Carpels* 5, hairy, one perfect, the others reduced to filaments. *Drupe* subglobose, ½ in., black.

In dry hot forests of Dehra Dun, Saharanpur, Rohilkhand, Oudh, Gorakhpur, Merwára and Bundelkhand, associated with *sál, mohua* and *dhák*. DISTRIB.: Sub-Himalayan tract from the Sutlej, ascending to 3,000 ft.;

also in Bengal, C. and S. India and Burma. The tree is leafless for a very short time Flowers Feb.-March. The kernel (*chironji*), which contains a sweet and wholesome oil, is much used in sweetmeats. The bark is used for tanning; a pellucid gum exudes from the stems, which is employed medicinally and for other purposes. The heartwood seasons well and is much valued.

2. **Rhus,** Linn.; Fl. Brit. Ind. ii, 9.

Trees or shrubs, often with an acrid juice. *Leaves* alternate, simple or 1-3-foliolate or pinnate. *Flowers* small, in terminal and axillary panicles, polygamous. *Calyx* 4-6-parted, persistent; lobes imbricate. *Petals* 4-6, equal, spreading, imbricate. *Stamens* 4, 5, 6, or 10, inserted at the base of the disk, free; *filaments* subulate; *anthers* short. *Ovary* sessile, ovoid or globose, 1-celled; *styles* 3; *stigmas* simple or capitate; *ovule* pendulous from a basal funicle. *Drupe* small, dry, compressed. *Seeds* pendulous.—Species about 120, natives chiefly of warm temperate regions.

Branches not spinescent, leaflets irregularly crenate towards the apex	1. *R. parviflora*.
Branches usually spinescent, leaflets smaller, deeply dentate or lobed	2. *R. mysurensis*.

1. R. parviflora, *Roxb. Fl. Ind. ii, 100; Royle Ill. 159; D. & G. Bomb. Fl. Suppl. 19; Brand. For. Fl. 119; F. B. I. ii, 9; Watt E. D.* Vern *Tungla.*

An unarmed softly tomentose shrub; branchlets, leaves beneath, petioles and panicle densely clothed with soft rusty tomentum. *Leaves* palmately 3-foliolate; *petiole* 1-1½ in.; *leaflets* 1½-3 in., sessile or the terminal contracted into a petiole, elliptic oblong-obovate or orbicular, irregularly crenate above the middle, coriaceous; *nerves* spreading, parallel. *Panicles* longer than the leaves; *pedicels* very short; *bracts* linear. *Sepals* ovate, outer hairy. *Petals* twice as long, oblong. *Disk* 5-lobed. *Drupe* ⅛ in. across, ovoid, compressed, red-brown, shining.

Siwalik range towards the Jumna (Mackinnon). DISTRIB.: W. Himalaya up to 5,000 ft., Pachmarhi in the Central Provinces. Flowers May and June. The fruits are sold in the bazars under the name of *tantarik*, and mixed with salt are used medicinally like tamarinds. The leaves are sometimes employed as a substitute for tobacco in Garhwál.

2. R. mysurensis. *Heyne ex W. & A. Prod. 172; Royle Ill. 174; Brand. For. Fl. 119; F. B. I. ii, 9; Watt B. D.* Vern. *Dasarni, dasan* Merwára).

A small pubescent shrub with flexuous often spiny branches. *Leaflets* smaller than those of the preceding, obovate or cuneate, sinnate-toothed or lobed, ash-coloured tinged with red. *Panicles* very slender, subsimple. *Flowers* minute. *Disk* obscurely 5-lobed.

Dehra Dun (Jacquem.), Delhi (Royle, Merwára. DISTRIB.: Sindh, Punjab, Rajputana, Mysore. Flowers in Feb. The bark is used for tanning leather.

3. **Pistacia**, Linn.; Fl. Brit. Ind. ii, 13.

Trees or shrubs. *Leaves* alternate, exstipulate, pinnate or 3-foliolate. *Flowers* small, apetalous, dicœcious, in axillary racemes or panicles. MALE fl.: *Calyx* 3-5-fid. *Stamens* 3-7. *Disk* small. Rudiment of *ovary* minute or 0. FEM. flowers bracteate. *Sepals* 3-4. *Stamens* and *disk* 0. *Ovary* sessile, 1-celled; *style* short, 3-fid.; *stigmas* capitate, recurved; *ovule* pendulous from a basal funicle; *Drupe* dry; *stone* bony. *Seed* with a membranous testa. *Cotyledons* thick, oily, curved.—Species 6 or 7, Mediterranean region and W. Asia, and one in Mexico.

P. vera, L. is the Pistachio-nut tree, and is a native of Persia and Syria.

P. Khinjuk. *Stocks in Hook. Journ. iv, 143.* P. integerrima, *Stewart in Brand. For. Fl. 122, t. XXII; F. B. I. ii, 13, Watt E.D.* Rhus Kakrasingee, *Royle Ill. 175.* Vern. *Kakkar.*

A moderate-sized deciduous tree with rough grey bark. *Leaves* 6-9 in with or without a terminal leaflet; *petiole* terete, puberulous; *leaflet* stalked, in 4-5 sub-opposite pairs, lanceolate, caudate-acuminate, coriaceous, entire; nerves many, arched. *Panicles* lateral; those of the mal compact, pubescent; of the female lax, elongate. *Flowers* pedicelled with 2 ovate bracts. *Stamens* 5-7; *filaments* short; *anthers* large dark red. FEM. fl.: *Sepals* 4, linear. *Style* almost 3-partite. *Drupe* broader than long, glabrous, rugose, grey.

Dehra Dun, Siwalik range and Rohilkhand. DISTRIB.: Punjab Hills and W. Himalaya from the Indus to Kumaon, up to 8,000 ft. The new leaves and the bright red panicles begin to appear in March. The remarkable horn-shaped galls (*kakra singhi*), which are formed on the leaves and petioles, are used for dyeing and tanning and also medicinally. The foliage is largely used as fodder for camels. The heartwood is beautifully mottled with yellow and dark veins, and is much used for ornamental work.

4. **Odina**, Roxb.; Fl. Brit. Ind. ii, 29.

Trees with stout soft branches. *Leaves* few, at the ends of the branches, alternate, odd-pinnate; *leaflets* opposite, quite entire. *Flowers* small, 1-sexual, fascicled on racemose panicles. *Calyx* 4-5-lobed, persistent; *lobes* rounded, imbricate. *Petals* 4-5, imbricate. *Disk* annular, 4-5 lobed. MALE fl.: *Stamens* 8-10, inserted within the disk. *Ovary* (rudimentary) 4-5 parted. FEM. fl.: *Ovary* sessile

oblong, 1-celled ; *styles* 3-4, stout ; *ovule* pendulous from the top of the cell. *Drupe* small, compressed, reniform, crowned by the distant styles ; *stone* hard. *Seed* compressed. *Embryo* curved.—Species about 12, mostly African.

O. Wodier, *Roxb. Hort. Beng. 29; Fl. Ind. ii, 293; W. & A. Prod. 171; Royle Ill. 180, t. 31, f. 2; D. & G. Bomb. Fl. 51; Brand. For. Fl. 123; F. B. I. ii, 29; Watt E. D.* Vern. *Jhingan.*—The specific name '*Wodier*' is derived from a Tamil word.

A moderate-sized deciduous tree, with a thick trunk and exfoliating bark. *Branches* few; young parts clothed with stellate down. *Leaves* 12-18 in. long ; *petioles* terete ; *leaflets* 3-5 pairs, stalked, 3-6 in. long, oblong-ovate, candate-acuminate. *Flowers* 4-merous, fascicled. *Sepals* obtuse, ciliate. *Petals* twice as long, oblong, spreading, purplish and greenish-yellow. MALE fl. in compound racemes. *Stamens* 8, as long as the petals. FEM fl.: in simple racemes. *Ovary* surrounded at the base by short sterile stamens. *Drupe* on a short pedicel, glabrous, red when ripe.

In dry forests throughout the area. DISTRIB.: Hotter parts of India from the Indus and along the foot of the Himalaya, up to 4,000 ft., to Assam, Burma, the Andaman Islands and Ceylon. Flowers March and April, before the leaves appear. A yellowish-white gum is collected from the bark, and is much used in calico-printing, and also medicinally. The bark is employed for dyeing tassar silk, and also as a tanning material. Various parts of the tree are used medicinally. The leaves and young shoots afford fodder for cattle; and the close-grained heartwood, which seasons well, is used for many purposes.

5. Semecarpus, Linn. f. ; Fl. Brit. Ind. ii, 30.

Trees. *Leaves* alternate, simple, entire, coriaceous. *Flowers* small, polygamous or dicœcious, in terminal, rarely axillary panicles. *Calyx* 5-6-fid, segments deciduous. *Petals* 5-6, imbricate. *Disk* broad, annular. *Stamens* 5-6, inserted at the base of the disk *Ovary* 1-celled ; *styles* 3 ; *ovule* pendulous from a basal funicle. *Drupe* fleshy obliquely oblong or subglobose, seated on a fleshy receptacle formed of the thickened disk and calyx base *Pericarp* loaded with acrid resin. *Seed* pendulous, testa coriaceous, inner coat somewhat fleshy. —Species about 40, natives of Trop. Asia and Australia,

8. Anacardium, *Linn. f. Suppl. 182. Roxb. Fl. Ind. ii, 83; W. & A. Prod. 168; D. & G. Bomb. Fl. 52; Brand. For. Fl. 124 ; F. B. I. ii, 30 ; Watt E. D.* Vern. *Bhiláwa.* (The Marking-nut tree).

A medium-sized dicœcious or polygamous deciduous tree with a rough dark-coloured bark, yielding an acrid juice. Young parts leaves beneath and panicles pale tomentose. *Leaves* very large, crowded towards the

extremities of the branches, oblong or obovate-oblong, rounded at the apex, rounded cordate or cuneate at the base, usually contracted below the middle, entire, coriaceous, hispidly pubescent beneath : lateral nerves 16-24 pairs, stout, slightly arched ; *petioles* short and thick, not winged. *Panicles* equalling or shorter than the leaves, stout, branches spreading. *Flowers* ¼-⅓ in. in diam , subsessile, fascicled, greenish-white, oblong, much longer than the calyx ; *filaments* subulate. *Drupe* 1 in. long, obliquely ovoid or oblong, smooth, shining, black, seated on an orange-red cup.

Siwalik range, Dehra Dun, Rohilkhand, Oudh, Gorakhpur. DISTRIB.: Outer Himalaya from the Sutlej to Sikkim, and throughout the hotter parts of India to Assam, absent in the E. Peninsula and in Ceylon, extending to the E. Archipelago, and N. Australia. Leafless between Feb. and April, the new leaves and flowers appearing in May. The pericarp of the fruit is largely used in dyeing, and a kind of marking ink is also prepared from it. Its medicinal properties are fully described in the Dictionary of Economic Products. The fleshy cup or hypocarp is eaten after being roasted.

VAR. cuneifolia, *Roxb.; Fl. Ind. ii, 86 (sp.); Royle Ill. 174 ;* leaves cuneate at the base. Dehra Dun. DISTRIB.: Trop. Himalaya, Behar, Khasia Hills, Konkan.

Mangifera, Linn.; Fl. Brit. Ind. ii, 13.

Trees. *Leaves* alternate, simple, petioled, quite entire, coriaceous. *Flowers* small, polygamous, in terminal panicles ; *pedicels* jointed ; *bracts* deciduous. *Calyx* 4-5 partite ; segments imbricate, deciduous. *Petals* 4-5, free or adnate to the disk, imbricate *Stamens* usually 1-5, inserted just within the disk or on it, usually only one perfect and much larger than the others. *Ovary* sessile, 1-celled, oblique ; *style* lateral ; *ovule* usually pendulous from a basal funicle. *Drupe* large, fleshy ; *stone* compressed, fibrous. *Seed* large, compressed, testa papery.—Species about 30, chiefly Malayan.

M. indica, *Linn. Sp. Pl. 200 ; Roxb. Fl. Ind. i, 461 ; W. & A. Prod. 170 ; Royle Ill. 170; D. & G. Bomb. Fl. 51 ; Brand. For. Fl. 125 ; F. B. I. ii, 13 ; D C. L'Orig. Pl. Cult. 159 ; Watt E. D.* Vern. *Ám, ambi.* (The Mango-tree.)

A large evergreen tree with widely spreading branches and dark-coloured bark, quite glabrous except the panicles. *Leaves* crowded at the ends of the branches, 6-12 in. long, oblong or obovate-lanceolate, acute acuminate or obtuse, acute at the base, margins often undulate, purplish-green when young, dark green when mature, shining ; lateral nerves many, arcuate ; *petioles* swollen at the base. *Panicles* terminal, about 1 ft. long, usually tomentose ; *bracts* elliptic, concave. *Flowers* pale yellow, scented, subsessile, male and 2-sexual on the same panicle. *Sepals* oblong, concave. *Petals* twice as long, with 3-5 dark yellow ridges. *Disk* fleshy,

5-lobed. Fertile *stamen* 1, the others reduced to short filaments; *anther* purple. *Ovary* glabrous. *Drupe* 2-6 in. long, laterally compressed.

Hilly parts of the Gonda and Bahraich districts of Oudh (Brandis), and probably in other localities within the area. DISTRIB.: Tropical Himalaya from Garhwál to the Bhutan and Khasia Hills, up to 3,000 ft., Behar and on the hills of C. and S. India. Cultivated throughout the greater part of India, and in most tropical countries. Flowers during March and April, and the fruit ripens during the early part of the rainy season, though some kinds are obtainable as early as May and others are available as late as November. Over 500 distinct varieties have been enumerated. The finest fruits are usually obtained from grafts, but in some favoured localities seedlings of good kinds produce the same variety. For other useful products yielded by this tree Dr. Watt's Dictionary should be consulted.

7. **Spondias,** Linn.; Fl. Brit. Ind. ii, 42.

Deciduous glabrous trees. *Leaves* usually crowded at the ends of the branches, alternate, odd-pinnate. *Leaflets* sub-opposite, usually caudate-acuminate *Panicles* terminal, spreading. *Flowers* small, polygamous. *Calyx* small, 4-5-fid., deciduous, lobes slightly imbricate. *Petals* 4-5-spreading, sub-valvate. *Disk* cupular, broad, crenate. *Stamens* 8-10, inserted beneath the disk. *Ovary* sessile, free, 4-5-celled; *styles* 4-5, conniving.; *ovules* solitary, pendulous in the cells. *Drupe* fleshy; *stone* hard, thick, 1-5-celled. *Seeds* pendulous, testa membranous.—Species about 8, all tropical.

S. mangifera, *Willd. Sp. Pl. ii, 751; Roxb. Fl. Ind. ii, 451; W. & A. Prod. 173; Royle Ill. 179; D. & G. Bomb. Fl. Suppl. 19; Brand. For. Fl. 128; F. B. I. ii, 42; Watt E. D.* Vern. *Ambára, amra.* (Hog-plum.)

A small tree with greyish bark. *Leaves* 1-1½ ft.; petiole slender; *leaflets* 4-6 pairs, 2-9 in. long, shortly stalked, oblong, acuminate, entire, more or less oblique, shining; *nerves* 10-30 on each side, horizontal, joined by a strong intramarginal one. *Panicles* 1-2 ft., spreading, sparingly branched. *Flowers* ¼ in. across, uni- or bisexual. *Calyx* 5-toothed *Petals* oblong, greenish-white. *Disk* 10-toothed. *Filaments* short, subulate. *Drupe* 1½-2 in. long, yellow, smooth; *flesh* very austere; *stone* cavernous, fibrous outside. *Seeds* 1-3, usually one perfect.

Dry forests of Dehra Dun, Saharanpur, Rohilkhand, Oudh and Gorakhpur. DISTRIB.: From the Indus eastward, and south to Ceylon, ascending to 5,000 ft on the Himalaya; also in Burma and the Malay Peninsula; often cultivated. The tree is leafless from December until April when the flowers appear, and the fruit ripens during the cold season. An insipid darkish-coloured gum exudes from the bark Various parts of the tree are used medicinally. The acid astringent fruit is eaten, but usually as a pickle. It is greedily eaten by deer and cattle.

XLI.—CORIARIEÆ.

USUALLY glabrous shrubs, with 4-angled sarmentose branches, the lower ones opposite; buds scaly. *Leaves* opposite, rarely 3-nately whorled, sessile, entire, exstipulate. *Racemes* axillary. *Flowers* small, green, hermaphrodite or polygamous *Sepals* 5, spreading, imbricate, persistent. *Petals* smaller than the sepals, fleshy, keeled within, thickened after flowering and embracing the fruit. *Stamens* 10, hypogynous, free, or the alternate ones adnate to the petals; *filaments* short; *anthers* large, oblong, rough. *Disk* 0. *Carpels* 5-10, free, 1-celled, whorled on a fleshy receptacle; *styles* slender, subulate, fleshy, papillose all over; *ovules* 1 in each cell, pendulous from the top. *Fruit* of 5 or 10 small oblong compressed dry nuts, closely embraced by the fleshy petals, 1-celled, 1-seeded. *Seed* compressed, testa membranous, albumen a thin layer.—Species about 8, found in the Mediterranean region, in Temp. Asia, Japan, N. Zealand and in C. and S. America.

The true position of this small order has not yet been determined with certainty. Sir Joseph Hooker in his Fl. Brit. Ind. considered it as perhaps nearest to *Phytolaccaceæ* which, he remarks, should in that work have been placed in *Thalamiflorœ*. *Coriaria* is placed by Baillon as a genus in *Rutaceæ*, and by Engler and Prantl as a distinct order between *Empetraceæ* and *Buxaceæ*. By other authors it has been referred provisionally to *Olacineæ*, *Sapindaceæ* and *Anacardiaceæ*.

Coriaria, Niss. ex Linn.; Fl. Brit. Ind. ii, 44.

Characters of the order.

C. nepalensis, *Wall. Pl. As. Rar. iii, 289; Royle Ill. 165; Brand. For. Fl. 128; F. B. I. ii, 44; Watt E. D.* Vern. *Masuri*.

A large shrub or small tree with rough reddish-brown bark. *Branchlets* quadrangular, often tinged with red. *Leaves* 2-4 in. long; opposite, 3-7-nerved, very shortly petioled, ovate-oblong or lanceolate, acute or abruptly acuminate, cordate, entire or minutely serrulate, glabrous or hispidulous on the veins beneath. *Racemes* 2-6 in., solitary or in clusters; *bracteoles* oblong, concave, deciduous. *Flowers* about ⅛ in. in diam. *Fruit* ¼-⅓ in., black.

On both sides of the Siwalik range. DISTRIB.: Temperate and subtropical Himalaya from the Indus to Bhutan, up to 7,500 ft. Flowers March to May. Very plentiful about Mussoorie, the name of which place is believed to have originated from this fact. The ripe berries are eaten, but are said to be liable to cause colic if the seeds are not rejected. The leaves are used medicinally. The handsome mottled wood takes a good polish, and might be used in the manufacture of various small articles.

XLII.—MORINGEÆ.

DECIDUOUS trees with soft wood; *leaves* alternate, odd-pinnate or 2-3-pinnate; *leaflets* opposite, quite entire, glandular at the base, caducous. *Panicles* axillary. *Flowers* irregular, 2-sexual. *Calyx* cup-shaped, 5-cleft; segments unequal, petaloid, deciduous from above the base, imbricate. *Petals* 5, unequal. Fertile *stamens* 5, inserted on the edge of the disk, declinate, opposite the petals and alternating with 5 antherless filaments; *anthers* dorsifixed, 1-celled. *Disk* lining the calyx-tube. *Ovary* stipitate, 1-celled; *style* slender, tubular; *stigma* perforated; *ovules* many, in 2 series, on 3 parietal placentas. *Capsule* elongate, beaked, 3-6-angled, 1-celled, loculicidally 3-valved, corky within. *Seeds* many, winged or not, in pits of the valves, testa corky, albumen 0.—Species 3, natives of W. Asia and N. Africa.

An order of very doubtful affinity, having been referred by various authors to near *Resedaceæ*, also to *Capparideæ*, *Melianthæ*, *Violaceæ*, *Polygalaceæ*, *Leguminosæ* and *Bignoniaceæ*.

Moringa, Burm. Fl. Brit. Ind. ii, 45.

Characters of the order.

Leaves usually 3-pinnate, flowers white	1. *M. pterygosperma.*
Leaves 2-pinnate, flowers yellowish streaked with pink . . .	2. *M. concanensis.*

1. **M. pterygosperma**, *Gærtn. Fruct. ii, 314; W. & A. Prod. 178; Royle Ill. 180; D. & G. Bomb. Fl. 314; Brand. For. Fl. 129; F. B. I. ii, 45; Watt E. D.* Hyperanthera Moringa, *Vahl; Roxb. Fl. Ind ii, 368.* Vern. *Sanjna.* (Horse-radish tree.)

A small tree with corky bark, wood soft, root pungent, young parts tomentose. *Leaves* 1-2 ft., usually 3-pinnate; petiole slender, sheathing at the base; pinnæ 4-6 pairs; *leaflets* 6-9 pairs ½-¾ in., opposite, elliptic ovate or obovate, pale beneath, nerves obscure; glands linear, hairy. *Panicles* spreading, bracts linear. *Flowers* pedicelled, 1 in. in diam., white, honey-scented. *Sepals* linear-lanceolate, reflexed. *Petals* narrowly spathulate. Fertile *filaments* villous at the base. *Ovary* hairy. *Capsule* 9-20 in., pendulous, 9-ribbed. *Seeds* about 1 in. long, trigonous, winged at the angles.

Forests of Dehra Dun, Saharanpur, Rohilkhand and Oudh. DISTRIB.: Outer Himalaya at low elevations. Cultivated throughout the hotter parts of India, and in most tropical countries. Flowers February to April, and the fruit ripens in May and June. The root and other portions of the tree are used medicinally. The root is a well-known substitute for the true horse-radish The foliage is often given as fodder to camels.

2. **M. concanensis.** *Nimmo in J. Grah. Cat. Bomb. 43; D. & G. Bomb. Fl. 311; Brand. For. Fl. 130; F. B. I. ii, 45; Watt E. D.; Stapf in Hook. Ic. Pl. 2596.* Vern. *Sainjna.*

A small tree with 2-pinnate leaves. *Leaflets* larger and fewer than in the preceding, broadly elliptic or suborbicular. *Petals* yellowish streaked with pink. *Capsule* acutely triquetrous, valves hard. *Seeds* ½ in. long.

Merwára forests (Duthie). DISTRIB.: Baluchistan, Sindh, Rajputana, Bombay. Fl. in November and December. The unripe fruit and the flowers are eaten as a pot herb, and the pungent roots are said to be used, like those of the preceding, as a substitute for horse-radish.

XLIII.—LEGUMINOSÆ.

HERBS, shrubs or trees. *Leaves* stipulate and usually alternate, pinnate or digitate or simple, often stipellate, sometimes with the rachis ending in a tendril. *Inflorescence* axillary leaf-opposed or terminal, usually simply racemose or panicled; *bracts* and *bracteoles* usually both present. *Flowers* usually irregular and hermaphrodite, rarely regular or polygamous. *Sepals* 5, combined or free, often unequal, sometimes forming a 2-lipped calyx. *Petals* 5, rarely fewer by arrest, very rarely 0, usually free and unequal. *Stamens* normally 10, perigynous or almost hypogynous, rarely fewer or indefinite; *filaments* free or variously combined; *anthers* 2-celled, almost always bursting longitudinally. *Ovary* free; *style* simple, cylindric, usually declinate; *stigma* capitate, terminal or oblique; *ovules* 1 or more on the ventral suture. *Fruit* usually dry, a pod splitting open along both sutures or on the ventral suture only, sometimes continuous and indehiscent, or separating into 1-seeded indehiscent segments. *Seeds* usually exalbuminous. *Cotyledons* foliaceous or amygdaloid with a straight or inflexed accumbent radicle. A very large order, composed of three easily recognized suborders, and containing altogether about 8,000 species. The largest of these three suborders, *Papilionaceæ*, is cosmopolitan in its distribution; the other two, *Cæsalpinieæ* and *Mimoseæ*, do not extend beyond the tropical and warm temperate zones.

Key to the Suborders and Tribes.

Petals imbricate.

Calyx-segments united above the level of the disk, the upper petal (standard) exterior (Suborder I. PAPILIONACEÆ).

Stamens 1 or 2-adelphous.

Pods dehiscent along both sutures (indehiscent in *Psoralia*).

Leaves simple, digitate or pinnate, if even-pinnate the rachis not produced.

Leaves simple or digitately 3-fol., stamens 1-adelphous — I. GENISTEÆ.

Leaves pinnately 3-fol. leaflets toothed, stamens 2-adelphous . . . — II. TRIFOLIEÆ.

Leaves pinnately 3-fol., rarely (in *Clitoria*) 5-7-fol., or (in *Flemingia*) 1-fol. or digitately 3-fol. and then with 2-adelph. stamens; when stamens are 1-adelph. the upper filam. is attached to the others at the base — III. PHASEOLEÆ.

Leaves odd-pinnate except in *Sesbania*, rarely simple, not toothed; stamens usually 2-adelph., but if 1-adelph. the upper stamen is free at the base . . . . . — IV. GALEGEÆ.

Leaves even-pinnate, the rachis continued as a tendril or bristle, stamens 2-adelphous . — V. VICIEÆ.

Pods indehiscent, or opening along the lower suture.

Pods not segmented, always quite indehiscent, leaves odd-pinnate . . . . — VI. DALBERGIEÆ.

Pods breaking into 1-seeded indehiscent segments, or if dehiscent (*Desmodium* in part) opening along lower suture only, leaves odd-pinnate (except in *Zornia* and *Smithia*) . — VII. HEDYSAREÆ.

Stamens free . . . . . — VIII. SOPHOREÆ.

Cal.-segments free to the level of the disk (except *Bauhinieæ*), upper petal interior (Suborder II. CÆSALPINIEÆ).
- Leaves simple or simply pinnate
  - Anthers basifixed . . . IX. CASSIEÆ.
  - Anthers versatile.
    - Petals 5 . . . . X. BAUHINIEÆ.
    - Petals fewer than 5 . . XI AMHERSTIEÆ.
- Leaves 2-pinnate . . . . XII. EUCÆSALPINIEÆ.

Petals valvate (Suborder III. MIMOSEÆ).
- Stamens definite.
  - Anthers gland-tipped . . . XIII. ADENANTHEREÆ.
  - Anthers not gland-tipped . . XIV. EUMIMOSEÆ.
- Stamens indefinite.
  - Filaments free . . . . XV. ACACIEÆ.
  - Filaments united . . . . XVI. INGEÆ.

Suborder I. Papilionaceæ.

Herbs or shrubs (often climbing) rarely trees. *Leaves* simple or digitately or pinnately compound, rarely even-pinnate, usually stipellate. *Flowers* mostly irregular, usually hermaphrodite. *Sepals* 5, united beyond the disk in a campanulate or tubular calyx; limb truncate, 5-toothed or 5-lobed, or 2-lipped. *Petals* 5, usually imbricate and dissimilar and unequal, the upper one (*standard*) outermost, the two lateral ones (*wings*) usually overlying the frequently connate petals forming the *keel*, to which the wings are sometimes attached. *Stamens* inserted with the petals on a disk lining the base of the calyx, normally 10, rarely fewer, in 2 bundles (*diadelphous*) of 9+1 or 5+5, or in one bundle (*monadelphous*), rarely free. *Anthers* usually bursting longitudinally. *Albumen* 0 or very scanty.

TRIBE I.—GENISTEÆ.

- Anthers uniform, keel-petals scarcely cohering, leaves 3-foliolate . . . 1. ROTHIA.
- Anthers dimorphous, keel-petals firmly cohering.
  - Pods flat, leaves simple . . . 2. HEYLANDIA.
  - Pods turgid, leaves simple or 3-fol. . 3. CROTALARIA.

TRIBE II.—TRIFOLIEÆ.

Racemes long. . . . . 4. MELILOTUS.

Racemes short.

Pods straight or recurved . . . 5. TRIGONELLA.

Pods spiral . . . . . 6. MEDICAGO.

TRIBE III.—PHASEOLEÆ.

Leaves gland-dotted beneath. (Sub-tribe CAJANEÆ.)

Ovules 3 to many.

Pods with depressed lines between the seeds.

Seeds strophiolate . . . 7. ATYLOSIA.

Seeds not strophiolate . . . 8. CAJANUS.

Pods without depressed lines between the strophiolate seeds . . . . 9. DUNBARIA.

Ovules 1-2.

Calyx lobes accrescent, a climbing shrub . . . . . 10. CYLISTA.

Calyx-lobes not accrescent.

Leaves simple or digitately 3-fol. . 11. FLEMINGIA.

Leaves 1-fol., funiculus at end of hilum. (Habit of *Crotalaria*) . 12. ERIOSEMA.

Leaves pinnately 3-fol., funiculus, almost central on hilum . . 13. RHYNCHOSIA.

Leaves not gland-dotted beneath.

Style bearded (Sub-tribe EUPHASEOLEÆ.)

Keel spiral . . . . . 14. PHASEOLUS.

Keel not spiral—

Stigma oblique . . . 15. VIGNA.

Stigma terminal . . . 16. DOLICHOS.

Style beardless (except in *Clitoria*)

Rachis of inflorescence not swollen at the nodes, style bearded on the inner side in *Clitoria*. (Sub-tribe GLYCINEÆ.)

Stamens 1- or 2-adelpous, stipules and bracts persistent

Petals very unequal, stamens 1-adelphous . . . . 17. CLITORIA.

Petals nearly equal, stamens 2-adelphous.

Calyx-teeth distinct . . . 18. SHUTERIA.

Calyx with oblique truncate mouth . . . . . 19. DUMASIA.

Stamens 1-adelphous; stipules and bracts minute, caducous.

Anthers uniform, all fertile . . 20. GLYCINE.

Alternate anthers abortive . . 21. TERAMNUS.

Rachis of inflorescence swollen at the nodes.

Stamens 1-adelphous, petals nearly equal (Subtribe DIOCLEÆ).

Calyx campanulate . 22. PUERARIA.

Upper lip of calyx projecting . 23. CANAVALIA.

Stamens 2-adelphous

Petals very unequal (Sub-tribe ERYTHRINEÆ).

Anthers dimorphous, keel exceeding wing and standard . 24. MUCUNA.

Anthers uniform, standard exceeding keel and wings . . 25. ERYTHRINA.

Petals about equal (Subtribe GALACTIEÆ).

Pods dehiscent throughout. A twining herb . . . 26. GALACTIA.

Pod dehiscent at the seed-bearing apex only.

Flowers large, in racemes . 27. BUTEA.

Flowers small, in panicles . 28. SPATHOLOBUS.

TRIBE IV.—GALEGEÆ.

Anthers muticous, hairs basifixed.

Racemes or spikes terminal or axillary; pods 1-seeded, indehiscent, leaves gland-dotted. (Subtribe PSORALIEÆ). 29. PSORALIA.

Racemes all axillary; pods long, 2-valved, distinctly septate between the seeds. (Subtribe ROBINIEÆ) . . . 30. SESBANIA.

Racemes terminal or leaf-opposed or paniculate at the ends of the branches (Subtribe TEPHROSIEÆ).

Leaves striate-veined, stamens 2-adelph., pods dehiscing early. Herbs or undershrubs . . 31. TEPHROSIA.

Leaves reticulate-veined, stamens 1-adelph., pods tardily dehiscing. A large woody climber . 32 MILLETTIA.

Flowers in axillary, pedunculed racemes or heads; pods 2-valved, many-seeded, usually longitudinally 2-celled (Sub-tribe ASTRAGALEÆ) . 33. ASTRAGALUS.

Anthers with an apiculate or gland-tipped connective, hairs fixed by the centre (Subtribe INDIGOFEREÆ).

Stamens 1-adelphous . . 34. CYAMOPSIS.

Stamens 2-adelphous . . 35. INDIGOFERA.

TRIBE V.—VICIEÆ.

Stamens 10, diadelphous

Wings free from the keel, leaflets toothed . . . . . 36. CICER.

Wings attached to keel.

Stam.-tube with oblique mouth. Style longitudinally bearded with minute hairs on inner face 37. LENS.

Apex of style dorsally bearded by a bunch of hairs, or pilose all round . . . . 38. VICIA.

Stam.-tube truncate at the mouth.

Style flattened at the apex, leaflets entire . . 39. LATHYRUS.

Style dilated from the base upwards, leaflets obscurely dentate . . . . . 40. PISUM.

Tenth stamen absent. Climbers with bright polished seeds . . . 41. ABRUS.

TRIBE VI.—DALBERGIEÆ.

Leaflets alt. (Subtribe PTEROCARPEÆ).

Anthers small, terminal; pod oblong or linear . . . . . 42. DALBERGIA.

Anthers versatile, pod suborbicular 43. PTEROCARPUS.

Leaflets opp. (Subtribe LONCHOCARPEÆ).
Pod almost woody, not winged . 44. PONGAMIA.
Pod thin, winged . . . . 45. DERRIS.

TRIBE VII.—HEDYSAREÆ.
Stamens 1-adelph., anthers dimorphous, leaflets in 1-2 opp. pairs, exstipellate (Subtribe STYLOSANTHEÆ) . 46. ZORNIA.
Stamens 2-adelph., anthers uniform, leaves pinnate or simple.
Stamens in bundles of 5 and 5 (Subtribe ÆSCHYNOMENEÆ).
Pods folded within the calyx, leaves even-pinnate . . 47. SMITHIA.
Pods straight, exserted; leaves odd-pinnate . . . . 48. ÆSCHYNOMENE.
Stamens in bundles of 9 and 1 (Subtribe DESMODIEÆ).
Ovules solitary.
Leaves exstipellate . . 59. LESPEDEZA.
Leaves stipellate . . 50. ELEIOTIS.
Ovary 2- or more-ovuled
Pods twisted inside calyx
Calyx not accrescent . 51. URARIA.
Calyx accrescent . 52. LOUREA.
Pods not twisted inside calyx.
Joints of pod turgid, Calyx deeply cleft, leaves simple or 3-fol. Herbs 53. ALYSICARPUS.
Calyx-teeth short, leaves simple. A spinescent shrub . . . 54. ALHAGI.
Joints of pod flattened.
Racemes in fascicles from the old wood. A tree . . . . . 55. OUGEINIA.
Racemes simple or paniculed from the current year's shoots. Shrubs or herbs . . . 56. DESMODIUM.

TRIBE VIII.—SOPHOREÆ . . . 57. SOPHORA.

1. Rothia, Pers.; Fl. Br. Ind. ii, 63.

Diffuse annuals. *Leaves* petioled, digitately 3-foliolate. *Flowers* minute, in short axillary racemes. *Calyx*-tube turbinate, the teeth as long as the tube, the two upper broader and arched. *Corolla* scarcely exserted, all the petals narrow, nearly straight, distinctly clawed, those of the keel scarcely cohering. *Stamens* 1-adelphous; *anthers* uniform, minute. *Ovary* sessile, minute: *ovules* many; *style* short; *stigma* minute, capitate. *Pod* linear, slender, nearly straight, compressed, many-seeded, continuous within.—Species 2, one in India extending to N. Australia, the other Trop. African.

R. trifoliata, *DC. Prod. ii, 382; W. & A. Prod. 195; F. B. I. ii, 63; Watt E. D.* Trigonella indica, *Linn; Roxb. Fl. Ind. iii, 389.*

A much-branched hairy diffuse annual with slender stems a foot or more long. *Leaflets* ½-1 in. long, sessile, oblanceolate-oblong, minutely mucronate, rather fleshy, silky; *petioles* shorter than the leaflets; *stipules* free, small, ½ lunate, persistent. *Flowers* 1-4, shortly pedicelled. *Calyx* ⅛-¼ in., silky. *Corolla* inconspicuous, fugacious. *Pod* 1½-2 in., silky. *Seeds* numerous.

Bundelkhand (Edgeworth). DISTRIB.: South to Ceylon, and extending to Australia. The leaves and pods are boiled and eaten as a vegetable by the poorer classes.

2. Heylandia, DC.; Fl. Brit. Ind. ii, 64.

Leaves simple, exstipulate. *Flowers* small, solitary, axillary. *Calyx*-tube turbinate; teeth lanceolate, three lowest deeply cut, *Corolla* much-exerted; *standard* large, round; *wings* much smaller, obovate; *keel-petals* narrow, firmly cohering, narrowed into an incurved beak. *Stamens* 1-adelphous; *anthers* 2-morphous. *Ovary* sessile, 2-ovulate; *style* elongated, filiform, abruptly incurved at the base; *stigma* terminal. *Pod* oblong, flat, 1-2-seeded.—A single species, confined to India.

H. latebrosa, *DC. Mém. Leg. vi, 201; W. & A. Prod. 190; Royle Ill. 191; D. & G. Bomb. Fl. 54; F. B. I. ii, 65.* Crotalaria uniflora, *Kœn. in Roxb. Fl. Ind, iii, 271.*

A prostrate much-branched more or less silky herb. *Leaves* ½-¾ in. long, simple, close-set, alternate, subsessile, cordate-ovate, unequal at the base. *Flowers* in the axils of most of the leaves, subsessile, solitary, yellow. *Pod* ½-¼ in. long, silky.

Common within the area. DISTRIB.: Throughout tropical India, and in Ceylon.

3. Crotalaria, Linn.; Fl. Brit. Ind. ii, 65.

Herbs or shrubs with simple or digitately 3-foliolate rarely 5-7-foliolate leaves. *Flowers* in terminal or leaf-opposed racemes, often

large and showy. *Calyx*-tube short; teeth linear or lanceolate, free or somewhat connate in 2 lips. *Corolla* equalling or exceeding the calyx; *standard* rounded or ovate, shortly clawed; *wings* obovate-oblong, shorter; *keel* broad, equalling the wings, its petals united, much incurved and beaked. *Stamens* 1-adelphous; *anthers* dimorphous. *Ovary* sessile, rarely stipitate, linear, usually many-ovuled; *style* long, abruptly incurved at the base, bearded above; *stigma* small, oblique. *Pod* usually sessile, straight, linear or oblong, turgid or inflated, continuous within, 2-many-seeded. – Species about 250, spread throughout tropical and subtropical regions.

Leaves simple.
- Stipules decurrent as a persistent wing to the branches . . . . . 1. *C. alata.*
- Stipules, if present, not decurrent.
  - A rigid much-branched deciduous undershrub, stipules 0. . . . 2. *C. Burhia.*
  - Trailing or diffuse herbs.
    - Corolla not exserted.
      - Stipules 0.
        - Bracts subulate, minute, . 3. *C. prostrata.*
        - Bracts lanceolate, leafy. . 4. *C. hirta.*
      - Stipules subulate, minute. . 5. *C. humifusa.*
      - Stipules leafy, persistent. . 6. *C. ferruginea.*
    - Corolla exserted, stipules minute. . 7. *C. hirsuta.*
  - Erect herbs, often semi-shrubby.
    - Pods not longer than the calyx, glabrous.
      - Corolla yellow.
        - Calyx ⅛-¼ in. long, stipules 0. . . . 8. *C. linifolia.*
        - Calyx ¾-1 in. long, stipules minute . . . 9. *C. calycina.*
      - Corolla blue, stipules minute 10. *C. sessiliflora.*
    - Pods exserted, glabrous.
      - Branches slender, densely silky, stipules small . 11. *C. mysorensis.*
      - Stipules 0. . . . 12. *C. albida.*
      - Branches stout, glabrous or nearly so.
        - Leaves obtuse or retuse; bracts small, subulate. . 13. *C. retusa.*

Leaves acute; bracts leafy, persistent. . . . 14. *C. sericea.*

Pods exserted, hairy.

Branches angular; pods brown, velvety. . . . . 15. *C. tetragona.*

Branches terete, sulcate; pods clothed with persistent silky hairs. . . . 16. *C. juncea.*

Leaves 3-foliolate.

Pods 2-seeded, sessile, sub-globose . 17. *C. medicaginea.*

Pods many-seeded, stalked, oblong, glabrous. . . . . 18. *C. orixensis.*

1. C. alata, *Buch.-Ham. ex Roxb. Hort. Beng. 93; Fl. Ind. iii, 274; Don Prod. 241; Royle Ill. 191; F. B. I. ii, 69.* C. bialata, *Roxb. l.c.*

A suberect undershrub. Stems and under surface of leaves silky-pubescent. *Leaves* simple, 2-3 in. long, subsessile, obovate to ovate-oblong, obtuse or subacute, thin; *stipules* with lanceolate-deltoid points forming decurrent wings on the stem for nearly the whole length of the internodes. *Racemes* 2-3-flowered, on elongated often leafy lateral peduncles; *bracts* small, ovate, acuminate, persistent. *Calyx* densely silky; tube campanulate, bracteolate. *Corolla* pale-yellow, hardly exserted. *Pod* 1¼-1¾ in. long, distinctly stalked, glabrous, 30-40-seeded.

Dehra Dun, Rohilkhand, Oudh, Gorakhpur. DISTRIB.: Outer Himalaya, up to 6,000 ft., from the Punjab to Assam and the Khasia Hills; also in Bengal, Burma and the Malay Peninsula, extending to Java.

2. C. Burhia, *Buch.-Ham. in Wall. Cat. 5336; Royle Ill. 191; D. & G. Bomb. Fl. 54; Brand. For. Fl. 144; F.B.I. ii, 66; Watt E. D.* Vern. *Khip.*

An erect or procumbent shrub. *Branches* many, slender, rigid when old, and sometimes ending in spines, tomentose. *Leaves* simple, ¼-1½ in. long, distant, oblong or lanceolate, rigid, pale-green, silky; stipules 0. *Flowers* in elongated terminal racemes; *pedicels* very short, 2-bracteolate. *Calyx* densely silky, teeth lanceolate. *Corolla* yellow with reddish veins, hardly exserted. *Pod* oblong, a little longer than the calyx, villous.

In sandy and rocky ground, especially near Agra and in Merwára. DISTRIB.: Sindh, Punjab, Rajputana, Cambay, extending to Baluchistan and Afghanistan. Flowers during the cold season. The branches and leaves are used as a cooling medicine, and in Rajputana they are valued as fodder. In the Punjab its fibre is made use of for cordage.

3. C. prostrata, *Rottl. in Willd. Enum. Hort. Berol. 747; Roxb. Fl. Ind. iii, 270; W. & A. Prod. 159 (excl. syn.); F.B I. ii, 67; Watt E. D.*

A diffuse perennial herb. *Stems* slender, clothed with yellowish-brown silky hairs. *Leaves* ½-1½ in. long, nearly sessile, rather obliquely obovate-

oblong, obtuse, hairy on both sides, glaucous beneath; *stipules* 0. *Racemes* 2-4-flowered, longer than the leaves. *Calyx* densely silky, teeth linear. *Corolla* small, yellow, hardly exserted. *Pod* nearly sessile, linear-oblong, about ½ in. long, glabrous.

Throughout the area. DISTRIB.: Punjab and Bengal to Ceylon, ascending the Himalaya to 6,000 ft.; also in Upper Burma and Java. The plant is used medicinally.

4. C. hirta, *Willd. in Gen. Naturf. Fr. Neue Schr. iv. 217; W. & A. Prod. 182; F.B.I. ii, 70.* C. chinensis, *Roxb. Fl. Ind. iii, 268 (not of Linn.).*

A diffuse annual with slender branches, thinly clothed with spreading rufous hairs. *Leaves* shortly stalked ½-¾ in. long, linear, obtuse, rounded at the base; *stipules* 0. *Flowers* crowded in racemes at the end of leafy branches; *bracts* lanceolate, leafy; *pedicels* very short. *Calyx* ¼ in., densely silky; teeth long, linear, acuminate. *Corolla* hardly exserted. *Pod* oblong, twice as long as the calyx, glabrous.

Bundelkhand, Guna in C. India (King), Saugor (Jerdon). DISTRIB. Behar, S. India.

5. C. humifusa, *R. Grah. in Wall. Cat. 5421; F.B.I. ii, 67.*

A diffuse trailing herb. *Stems* slender, flexuose, much-branched, densely clothed with short spreading yellowish-brown silky hairs. *Leaves* nearly sessile, ½-1 in. long, roundish or oblong, membranous, glaucous beneath, equal at the base; *stipules* minute, subulate. *Peduncles* arcuate, densely silky, laxly 3-6-flowered, longer than the leaves, sometimes leafy below; *pedicels* deflexed, the lower ones as long as the calyx; *bracts* very small. *Calyx* teeth linear, very long, densely silky. *Corolla* very small, yellowish, not exserted. *Pod* oblong, shortly stalked, ¼ in. long, glabrous.

Dehra Dun (Gamble). DISTRIB.: W. Himalaya from Garhwál to Sikkim and the Khasia Hills, up to 5,000 ft.; also on the Naga Hills, Upper Burma and in S. India.

6. C. ferruginea, *R. Grah. in Wall. Cat. 5393; F.B.I. ii, 68.*

A tall herb clothed with pale yellow or white silky hairs. *Leaves* 1-2, in. long, shortly stalked, obovate-oblong, obtuse, equal-sided, pale beneath; *stipules* leafy, persistent, often deflexed. *Racemes* elongated, laxly 2-8-flowered; *bracts* small, linear, persistent. *Calyx*-teeth long. *Corolla* hardly exserted. *Pod* shortly stalked, 1-1¼ in. long, linear-oblong glabrous.

Dehra Dun, Saharanpur district, Merwára. DISTRIB.: Nepal to Assam ascending to 6,000 ft.; also in Burma and Ceylon, extending to the Malay Peninsula, Java, China and the Philippines.

7. C. hirsuta. *Willd. Sp. Pl. iii, 978; Roxb. Fl. Ind. iii, 270; W. & A. Prod. 188; F. B. I, ii, 68.* C. rubiginosa, *Roxb. l. c. 269 (not of Willd.).*

A perennial diffuse silky herb. *Leaves* 1-2 in. long, ovate, acute, slightly oblique; *stipules* linear, minute. *Peduncles* slender, often leafy clothed with short spreading silky hairs. *Racemes* 2-8-flowered; *bracts*,

small, lanceolate. *Calyx* ¼ in., densely pubescent. *Corolla* yellow with purple spots, exserted. *Pod* sessile, oblong, downy, 8-10-seeded.

Merwára, Bundelkhand. DISTRIB.: Outer Himalaya at low elevations, Behar, S. India, Burma.

8. C. linifolia. *Linn. f. Suppl. 322; Roxb. Fl. Ind. iii, 266; Don Prod 241; W. & A. Prod. 190 (excl. syn.,); D. & G. Bomb. Fl. 56; F.B.I. ii, 72.* C. cæspitosa, *Roxb. l. c. 669.*

A perennial diffuse or erect herb. *Branches* many, slender, firm, terete, clothed with short appressed silky hairs. *Leaves* shortly stalked, oblanceolate, obtuse, rarely linear, base subcuneate; *stipules* 0. *Racemes* elongate, usually terminal, laxly flowered; *bracts* subulate, minute. *Calyx* ⅛-¼ in., 2 lipped, silky; upper teeth connate, lower linear. *Corolla* pale yellow, glabrous scarcely exserted. *Pod* sessile, ovoid-oblong, as long as the calyx, glabrous, black when ripe.

Dehra Dun (Gamble), Saugor (Jerdon). DISTRIB.: Sikkim, ascending to 4,000 ft., Chota Nagpur, C. and S. India and in Ceylon; also in the Malay Archipelago, China, the Philippines and in N. Australia.

9. C. calycina. *Schrank; Pl. Rar. Hort. t. 12; F. B. I. ii, 72.* C. stricta, *Roxb. Fl. Ind. iii, 265 (not of Roth).* C. anthylloides, *Don; W. & A. Prod. 181; Royle Ill. 191; D. & G. Bomb. Fl. 54 (not of Lamk.).*

An erect herb. *Branches* clothed with short appressed silky hairs. *Leaves* 2-6 in. long, subsessile, linear and acute or lanceolate and rather obtuse, obscurely silky beneath; *stipules* very minute, deciduous. *Flowers* few, in lax racemes, also solitary from leafy nodes; *bracts and bracteoles* large, lanceolate. *Calyx* ½-1 in. long, densely clothed with long silky hairs; teeth all long, the lower lanceolate and acuminate, the upper broader and subobtuse. *Corolla* shorter than the calyx, pale yellow, glabrous. *Pod* sessile, linear-oblong, included, glabrous, dark brown.

Siwalik range and in N. Oudh. DISTRIB.: Outer Himalaya up to 5,500 ft. in Kumaon, Bengal, Chittagong, Upper Burma and Shan Hills.

10. C. sessiliflora. *Linn. Sp. Pl, ed. ii, 1004; F. B. I. ii, 73.*

An erect annual, 1-2 ft. high. *Stems* simple or branched, clothed with short silky hairs. *Leaves* 2-6 in. long, linear or lanceolate, narrowed to both ends, thickly herbaceous, glabrous above; *stipules* setaceous, very small. *Flowers* crowed in elongated racemes, or occasionally solitary in the axils of the upper leaves, deflexed; *bracts* long, setaceous, persistent. *Calyx* up to ½ in. long, densely clothed with long silky hairs; tube shortly campanulate; teeth all long, acute, the upper lanceolate and narrow. *Corolla* blue and white, rarely yellow, glabrous, not exserted. *Pod* sessile ½ in. long, not exserted, oblong, glabrous.

Rohilkhand & N. Oudh. DISTRIB.: Outer Himalaya eastward to Assam; Punjab, C. India, Behar, Malay Penins., Nicobars, Java, China, Japan and in the Philippines.

11. C. mysorensis, *Roth Nov. Pl. 338; W. & A. Prod. 182; F. B. I. ii, 70.* C. stipulacea, *Roxb. Fl. Ind. iii, 264.*

A much-branched herb, 1-2 ft. high, clothed with long silky hairs. *Leaves* shortly stalked, 1-3 in. long, linear-oblong, obtuse, rounded at both ends, thinly silky; *stipules* small, linear, persistent. *Racemes* terminal and lateral, 6-9 in. long, stalked; *bracts* lanceolate, leafy. *Calyx* densely silky, ⅛ in. long; upper teeth lanceolate, lower linear. *Corolla* yellow, not exserted. *Pod* nearly sessile, twice as long as the calyx, oblong, glabrous, 20-30-seeded.

Common within the area. DISTRIB.: Throughout the hotter parts of India, and on the Himalaya up to 4,000 ft.

12. C. albida, *Heyne ex Roth Nov. Pl. 333; W. & A. Prod. 189; F. B. I. ii, 71.* C. montana, *Roxb. Fl. Ind. iii, 265; W. & A. Prod. 182.*

An erect perennial herb or small undershrub, 1-2 ft. high, with numerous firm slender terete obscurely silky branches. *Leaves* shortly stalked, 1-2 in. long, linear or oblanceolate, obtuse or mucronate, firm, gland-dotted, glabrescent above, thinly silky beneath; *stipules* 0. *Racemes* terminal, rarely lateral, 2-4 in. long, laxly 6-20-fid; *bracts* linear, very minute. *Calyx* turbinate, ¼ in. long, elongating in fruit, thinly silky; teeth long, 3 lower linear and acuminate, upper broader and often subobtuse. *Petals* yellow, sometimes tinged with lilac. *Pod* sessile, about twice as long as the calyx, oblong-cylindrical, glabrous, 6-12-seeded.

Dehra Dun, Rohilkhand, N. Oudh. DISTRIB.: Hotter Parts of India and in Ceylon, Burma, Malay Pen. and Islands, extending to China and the Philippines.

13. C. retusa, *Linn. Sp. Pl. 715; Roxb. Fl. Ind. iii, 272; W. & A. Prod. 187; Royle Ill. 191; D. & G. Bomb. Fl. 55; F. B. I. ii, 75; Watt E. D.*

An erect robust undershrub, 3-4 ft. high. *Branches* stout, striated, glabrous. *Leaves* 1½-3 in. long, oblong-lanceolate, usually retuse at the apex rarely subacute, base cuneate; *stipules* subulate, very small. *Racemes* terminal, 6-8 in. long, laxly 12-20 fid; *bracts* small, subulate, deflexed; *pedicels* shorter than the calyx. *Calyx* ⅜-½ in. long, nearly glabrous, teeth lanceolate, twice as long as the campanulate tube. *Corolla* nearly twice the length of the calyx, yellow tinged with purple. *Pod* distinctly stalked, 1-1½ in. long, exserted, oblong, glabrous, 15-20-seeded.

Dehra Dun, N. Oudh, Agra, Bundelkhand. DISTRIB.: Hotter portions of India from the Himalaya to Ceylon and in the Malay Pen.; extending to the Malay Islands, China, N. Australia; also in Trop. Africa and America, but doubtfully wild. This plant is cultivated in some parts of India for its fibre, which is sold as *san* hemp.

14. C. sericea. *Retz. Obs. V, 26; Roxb. Fl. Ind. iii, 273 (not of Burm.); W. & A. Prod. 186; Royle Ill. 191; D. & G. Bomb. Fl. 55; F. B. I. ii, 75; Watt E. D.* Vern. *Sanni.* (Punjab and Dehra Dun).

An erect robust undershrub, 3-4 ft. high. *Branches* stout, striated, nearly glabrous. *Leaves* shortly stalked, 2-6 in. long, oblong-lanceolate, acute or subacute, cuneate at the base, glabrous above, finely silky beneath; *stipules* large, leafy, persistent. *Racemes* terminal, often one foot long, lax, 20-40-fid; *bracts* ovate, leafy, persistent, deflexed; *pedicels* longer

than the calyx. *Calyx* ½ in. long, nearly glabrous; teeth lanceolate, twice the length of the campanulate tube. *Corolla* ⅔ in., much exserted, yellow tinged with purple. *Pod* 1-2 in., distinctly stalked, oblong exserted, glabrous.

Common within the area. DISTRIB.: Throughout tropical India, and on the Himalaya up to 3,000 ft.; also in Burma, the Malay Pen. and in the Andamans. Similar in habit to the preceding, but easily distinguished by the large stipules and bracts. Flowers during the cold season. Kanjilál states that it yields a fairly strong fibre. It is sometimes cultivated as an ornamental plant.

15. C. tetragona, *Roxb. Fl. Ind. iii, 263; W. & A. Prod. 185; Royle, Ill. 191; F. B. I. ii, 78; Watt E. D.*

An erect shrub, up to 6 ft. in height. *Branches* slender, angular, rigid sulcate, finely silky. *Leaves* shortly stalked, distant, 6-12 in. long, linear or lanceolate-acuminate, glabrescent or thinly silky on both sides; *stipules* minute, subulate. *Racemes* lateral and terminal, not panicled, 6-9 in. long, laxly 6-10-fid; *bracts* minute, linear. *Calyx* ⅔-1 in., densely brown-velvety; teeth long, linear or lanceolate, acuminate. *Corolla* little exserted, glabrous, lemon-coloured. *Pod* 1½-2 in., shortly stalked, exserted, densely and persistently velvety dark-brown, 12-20-seeded.

Dehra Dun and Siwalik range, N. Oudh, Nepal Terai. DISTRIB.: Sub-Himalayan tract from Garhwál to Sikkim and Assam, ascending to 3,500 ft. in Kumaon; extending to Burma and Java. A very handsome plant when in flower during the cold season.

16. C. juncea, *Linn. Sp. Pl. 714; Roxb.; Fl. Ind. iii, 259; W. & A. Prod. 185; Royle Ill. 194; D. & G. Bomb. Fl. 54; F. B. I. ii, 79; F. & G. Crops, N. W. P. and Oudh 82, t. xxi.* C. tenuifolia, *Roxb. l.c. 263.* Vern. *Sanai, arjha san.* (False, or San hemp.)

A tall stiff shrub. *Branches* slender, rod-like, terete, sulcate, thinly silky. *Leaves* rather distant, shortly stalked, 1½-3 in. long, linear or oblong, obtuse and mucronate, or acute, shining on both sides with reddish-brown silky hairs; *stipules* minute and subulate, or 0. *Racemes* lateral and terminal, not panicled, about one foot long, loosely 12-20-fid; *bracts* minute, linear; *Calyx* ¼-⅓ in. long, reddish-velvety, deeply toothed. *Corolla* bright yellow, exserted, glabrous. *Pod* 1-1½ in. clothed with short spreading persistent hairs, 10-15-seeded.

Cultivated as a rainy season crop for its fibre, chiefly in the divisions of Rohilkhand, Allahabad and Agra. It is occasionally met with as an escape. DISTRIB.: Cultivated throughout India from the base of the Himalaya to Ceylon, and in the E. Tropics generally. In the United Provinces the fibre of this plant is commonly known as *arjha san*, whilst that of the *patsan* (Hibiscus cannabinus) is called *lattia san.* Although not so white and silky, it is stronger and fetches a higher price than that of the latter. The green plant, as well as the seeds, are sometimes given as food to milch cows. The waste after extraction of the fibre is used in the manufacture of paper.

17. C. medicaginea, *Lamk. Encycl. ii, 201; W. & A. Prod. 192; F. B. I. ii, 81.* C. procumbens, *Roxb.; Fl. Ind. iii, 278; Watt E. D.*

A small perennial herb. *Branches* many, from a thick woody root-stock, slender, usually prostrate, thinly silky; *stipules* minute, deciduous. *Leaves* very small, 3-foliolate; *leaflets* a little longer than the petiole, oblanceolate obovate or oval, obtuse truncate or emarginate, glabrous above, obscurely silky beneath. *Racemes* terminal or leaf-opposed; *peduncles* exceeding the leaves; *bracts* minute, linear. *Flowers* very small. *Calyx* clothed with appressed silky hairs: teeth linear, longer than the tube. *Corolla* twice the calyx, yellow. *Pod* obliquely subglobose, ⅛ in. long, 2-seeded, clothed with appressed hairs.

Abundant within the area. DISTRIB.: throughout India from the W. Himalaya to Ceylon and Burma; also in Afghanstan, the Malay Islands, China and Australia. The plant is used medicinally in the Punjab and sold under the name of *gulabi*.

VAR. 1. neglecta, *F. B. I. l.c.* C. neglecta, *W. & A. Prod. 192.* A more robust plant, with stiff and somewhat ascending branches. *Leaflets* larger. *Racemes* 6-8 fld. In the Saharanpur herbarium there are specimens from Rohilkhand, N. Oudh and Gorakhpur.

VAR. 2. luxurians, *F. B. I. l.c.* C. luxurians, *Benth. Stems* erect, up to 3 ft. high, more pubescent than in the type. *Petioles* longer, and with the leaflets an inch or more long. *Racemes* 6-12-fld.—Dehra Dun, Saharanpur, Cawnpore, N. Oudh, Bundelkhand and Merwára. A favourite food of camels.

18. C. orixensis *Willd. in Gen. Naturf. Fr. Neue Schr. iv, 217; Roxb. Fl. Ind, iii, 276; W. & A. Prod. 193; D. & G. Bomb. Fl. 57; F. B. I. ii, 83.*

A perennial diffuse herb. *Branches* many, clothed with short spreading brown bulbous-based hairs. *Stipules* lanceolate, persistent. *Petiole* ¼-1 in. *Leaflets* 1-1½ in. long, obovate-oblong, obtuse, gland-dotted, hairy beneath. *Racemes* laxly 3-12-fld; *bracts* leafy, cordate, acuminate, reflexed; *pedicels* filiform, 3-4 times the calyx. *Calyx* ⅛ in., with linear teeth. *Pod* ½-¾ in., long-stalked, oblong, glabrous, 8-10-seeded.

Bundelkhand (Duthie), Guna (King). DISTRIB.: S. India.

Melilotus, Juss.; Fl. Brit. Ind. ii, 89.

Annual or biennial herbs. *Leaves* pinnately 3-foliolate; *leaflets* toothed. *Flowers* in long racemes. *Calyx-tube* campanulate; teeth nearly equal, deltoid or lanceolate. *Corolla* free from the staminal tube, caducous; *standard* and *wings* narrow; *keel* straight, obtuse. *Stamens* diadelphous; *filaments* not dilated, *anthers* uniform. *Ovary* sessile or stalked, few-ovuled; *style* filiform, glabrous, much incurved, *stigma* terminal. *Pod* oblong, exserted, indehiscent—Species upwards of 20, inhabiting temperate regions of the world.

Flowers yellow	1. *M. indica.*
Flowers white	2. *M. alba.*

1. M. indica, *All. Fl. Pedem. i, 303.* M. parviflora, *Desf.; W. & A. Prod. 196; Royle Ill. 197, F. B. I. ii, 89; Watt E. D.* Trifolium indicum, *Linn.; Roxb. Fl. Ind. iii, 388.* Vern *Sinji, metha.*

An annual with slender stems 1-½ ft. high. *Stipules* linear, acuminate. *Leaflets* obovate or oblanceolate, retuse or emarginate. *Racemes* dense-flowered, 1-2 in. in fruit. *Calyx-teeth* deltoid *Corolla* yellow, minute; *standard* exceeding the wings and keel. *Pods* ¼-½ in., obscurely reticulate-acunose, usually 1-seeded, glabrous.

Abundant throughout the area as a cold weather weed in corn-fields. DISTRIB. Punjab, Bengal and C. India, extending to S Europe. Introduced into N. America and S Africa Largely used as green fodder for cattle, and in some of the Punjab districts it is cultivated for this purpose

2. M. alba, *Desr. in Lamk. Encycl. iv, 63; F. B. I. ii, 89.* M. leucantha, *Koch; W. & A. Prod. 196; Royle Ill. 197.* (White Melilot).

Very similar to the preceding, but with larger and white flowers; the pods are also larger, and they are sometimes 2-seeded.

Plentiful throughout the area as a weed of cultivation, flowering during the cold season. DISTRIB. Plains of Punjab and Bengal, and on the Inner Western Himalaya up to 13,000 ft. It is found also in Europe and Siberia, and has been introduced in N. America The plant is very fragrant when drying, and it is said to be a good fodder for cattle.

5. Trigonella, Linn.; Fl. Brit. Ind. ii, 87.

Annual. *Leaves* pinnately 3-foliolate, toothed. *Flowers* in racemes; pale yellow. *Calyx-tube* campanulate; *teeth* distinct, subequal. *Petals* free from the staminal tube; *standard* and *wings* narrow; *keel* shorter, obtuse. *Stamens* diadelphous; *filaments* not dilated; *anthers* uniform. *Ovary* sessile, many-ovuled; *style* glabrous; *stigma* terminal. *Pod* linear or linear-oblong, flat or turgid; straight or curved, not spiral, usually exserted, many-seeded, continuous within.—Species about 70, mostly inhabiting the Mediterranean region.

Pod short, turgid	1. *T. occulta.*
Pod long, turgid, usually curved.	
Pod with a long beak	2. *T. Fœnum-græcum.*
Pod not beaked—	
Seeds 10-20	3. *T. polyceratа.*
Seeds 4-6	4. *T. hamosa.*
Pod narrow, linear, falcately recurved	5 *T. corniculata*

1. T. occulta, *Delile Fl. Ægypte Ill. 71; F. B. I. ii 87; Watt E. D.*

A diffuse densely cæspitose, glabrous or subglabrous annual, with slender stems. *Stipules* deeply cut; *petiole* exceeding the sharply toothed minute oblanceolate cuneate leaflets. *Flowers* 2-4 together in sessile axillary clusters. *Calyx-teeth* linear-setaceous. *Corolla* slightly exserted. *Pod* hardly exserted, ovate, puberulous, transversely reticulate, usually 2-seeded.

Near Lucknow (T. Anderson). Saugor (Jerdon). DISTRIB. Sind, extending to Egypt and Nubia.

2. T. Fœnum-græcum, *Linn. Sp. Pl. 777; Roxb. Fl. Ind. iii, 389; W. & A. Prod. 195; Royle Ill. 197; F. B. I. ii. 87; Field & Garden Crops iii, 46, t. xcix; DC. L'Orig. Pl. Cult. 89*; *Watt E. D.* Vern. *Methi* (Fenugreek).

A nearly smooth erect annual. *Stipules* not toothed; *leaflets* ¾-1 in. long, oblanceolate oblong, toothed. *Flowers* 1-2, axillary, sessile, *Calyx-teeth* linear. *Corolla* much exserted *Pod* 2-3 in. long, with a long persistent beak, often falcate, 10-20-seeded, without transverse reticulations.

Cultivated as a cold-season fodder-crop, chiefly in the north-western portion of the area. DISTRIB. Punjab and Kashmir, extending through Persia and Abyssinia to S. Europe. It is largely grown in the Punjab as a fodder-crop for cattle after the manner of lucerne. It is also used as a potherb, and the plant is well-known for its medicinal properties.

3. T. polyceratа, *Linn. Sp. Pl. 777; F. B. I. ii, 87.* T. incisa, *Royle Ill. 197.* Vern. *Chini.*

A slender diffuse annual, clothed with appressed pubescence. *Stipules* semi-sagittate, with long points; *leaflets* obovate, sharply incise-dentate towards the apex; base deltoid, entire. *Flowers* 1-6, sessile or on very short axillary peduncles. *Calyx* ¼in.; teeth setaceous, shorter than the subcylindrical tube. *Corolla* slightly exserted. *Pod* 1-2 in. long, falcate, transversely wrinkled, 10-20-seeded.

In cultivated ground, common. DISTRIB. Punjab Plain, and W. Himalaya up to 6,000 ft.; extending to W. Siberia and S. Europe. The plant is often used as fodder.

4. T. hamosa, *Linn. Syst. ed. X, 1180; F. B. I. ii, 88.* T. obcordata *Wall.; Royle Ill. 197.*

Annual, glabrous or slightly pubescent. *Stems* cæspitose, diffuse, 1 ft. or more long. *Stipules* broad, deeply cut; *leaflets* about ½ in. long, obovate-cuneate, with shallow teeth; base deltoid, entire. *Racemes* close, equalling or shorter than the leaves, terminated by a spine. *Flowers* 6-12, *pedicels* short *Calyx-teeth* lanceolate, shorter than the tube. *Corolla* three times the calyx. *Pod* about ½ in. long, hairy, much curved, with close transverse wrinkles, 4-6-seeded.

Etáwah dist. and Bundelkhand. DISTRIB. C. India; also in Afghanistan, Egypt, Nubia and S. Africa.

5. T. corniculata, *Linn. Syst. ed.* X, *1180. Roxb. Fl. Ind.* iii, *389; W. & A. Prod. 196; F. B. I. ii, 88.* T. fimbriata, *Royle Ill. 197.* T. esculenta, *Willd.; Royle l. c.*

A smooth much-branched suberect annual, 1 ft. or more high. *Stipules* toothed, points setaceous; *leaflets* ¼-½ in. long, obovate, cuneate, faintly incise-dentate. *Flowers* 6-12, in close racemes; *peduncles* exceeding the leaves, awned at the tip. *Calyx-teeth* shorter than the tube: *Pod* ½-¾ in., narrow, falcately recurved, acute, glabrous and marked with close transverse veins, 4-8-seeded.

Gwalior (Maries). DISTRIB. Lower Bengal, W. Himalaya *up to 12,000 ft.*; extending through Afghanistan to S. Europe.

6. MEDICAGO, Linn.; Fl. Brit. Ind. ii, 89.

Herbs, rarely shrubs. *Leaves* pinnately 3-foliolate; leaflets toothed. *Calyx-tube* campanulate, teeth subequal, *Corolla* more or less exserted, free from the staminal tube; *standard* and *wings* oblong; *keel* straight, obtuse. *Stamens* 2-adelphous, *filaments* filiform, *anthers* uniform. *Ovary* sessile, usually many-ovuled; *style* short, little incurved, *stigma* oblique. *Pod* usually spirally twisted, rarely sickle-shaped, many-seeded (1-seeded in *M. lupulina*), indehiscent, unarmed muricate or spinous.—Species upwards of 50, chiefly Mediterranean.

To this genus belongs the well-known fodder-plant called *lucerne* or *alfafa* (M. sativa, L.), which, according to M. DeCandolle (L' Orig. Pl. Cult. 81), is a native of W. temperate Asia. It is also found apparently wild on the Western Himalaya, and in Afghanistan and Baluchistan. It is now extensively grown in many parts of India, and affords excellent forage for horses and cows, if given in moderation. Although naturally a plant belonging to the temperate zone, it is able by means of its vigorous tap-root to withstand the fierce heat of an Indian summer. For information regarding its history and cultivation Dr. Watt's Dictionary article should be consulted, also a note by Mr. Mollison, published in the Agricultural Ledger No. 18 (1893).

Pod unarmed, 1-seeded	1. *M. lupulina.*
Pod bordered with spines, seeds many .	2. *M. denticulata.*

1. M. lupulina, *Linn. Sp. Pl. 779; Royle Ill. 197; F. B. I. ii. 90; Watt E. D.* (Black Medick).

A trailing biennial herb with finely downy stems, 1 ft. or more long; *stipules* toothed, with lanceolate acuminate points; *leaflets* obovate, faintly incise-crenate; base deltoid, entire. *Flowers* very small, yellow,

in heads, peduncles exceeding the leaves. *Calyx-teeth* setaceous, as long as the tube. *Corolla* slightly exserted. *Pods* minute, linear, sickle-shaped, faintly veined longitudinally, indehiscent, 1-seeded, glabrous or downy, turning black.

Common within the area as a cold-weather weed. DISTRIB. Plains of Punjab and Bengal, ascending to 12,000 ft. on the Himalaya. It extends through Afghanistan to Abyssinia, Europe and Siberia, and is sometimes cultivated for fodder. This plant is often regarded as the true *shamrock* in the place of *Trifolium repens*.

2. M. denticulata, *Willd Sp. Pl. iii, 1414; Royle Ill. 197; F. B. I. ii, 90; Watt E. D.*

An annual, with subglabrous stems. *Stipules* laciniate; *leaflets* ½-¾ in. long, obovate-cuneate, faintly toothed. *Peduncles* short, 2-6-flowered. *Calyx* ⅛ in.; teeth lanceolate, as long as the tube. *Corolla* yellow, twice the calyx. *Pods* subglobose, of 2-4 spirals, deeply reticulate, margined with a double row of spines.

Throughout the area, flowering during the cold season. DISTRIB. Plains of Sind, Punjab and Bengal, and up to moderate elevations on the Himalaya. It is found also in Afghanistan, and extends to Abyssinia and Europe, and eastward to China and Japan. It is largely collected as cattle fodder, and is said to be sometimes cultivated in the Punjab for that purpose.

7. ATYLOSIA, W. & A.; Fl. Brit. Ind. ii, 212.

Herbs or shrubs, erect or twining *Leaves* 3-foliolate, sometimes subdigitate, often exstipellate, gland-dotted beneath. *Flowers* axillary or racemed. *Calyx-teeth* distinct, longer or shorter than the tube, the lowest the longest. *Corolla* more or less exserted, marcescent or caducous, *keel* not beaked. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* sessile; *style* filiform, incurved, glabrous; *stigma* capitate; *ovules* 3. *Pod* linear or oblong, turgid, marked with transverse lines between the seeds, which have a conspicuous divided strophiole.—Species about 25, from India to Australia and Mauritius.

Petals marcescent
- Leaves not reticulate beneath, end leaflet longer than broad . . . . 1. *A. mollis.*
- Leaves strongly reticulate beneath, end leaflet not longer than broad . . 2. *A. crassa.*

Petals falling before the pod develops.
- Leaflets subdigitate.
  - Calyx-teeth short, corolla much exserted . 3. *A. albicans.*
  - Calyx-teeth long, corolla little exserted . 4. *A. scarabæoides.*
- Terminal leaflet with an elongated stalk . 5. *A. platycarpa.*

1. A. mollis, *Benth. in Pl. Jungh. 243; F. B. I. ii, 213 (excl. all syn. except Collœa mollis); Prain in Journ. As. Soc. Beng. LXVI (1897) 431.*

A twining herb with firm slender glabrescent branches. *Leaves* beneath densely and uniformly grey-downy, not reticulate; end-leaflet much longer than broad. *Flowers* yellow, over 1 in. long. *Pod* 2 in., transverse depressions between the seeds at right angles to the sutures. *Seeds* 8-10, their longer diameter across the pod.

Dehra Dun and Siwalik range. DISTRIB. From Chamba in the N. W. Himalaya to Sikkim.

2. A. crassa, *Prain in Journ. As. Soc Beng. LXVI, 45, 432.* A. mollis, *Benth. (in part); F. B. I. ii, 213 (in part).*

A twining herb with firm slender tomentose stems. *Leaves* 3-6 in. long, pinnately 3-foliolate; *leaflets* 2-3 in. long, subtrapezoid, cuspidate-acuminate at the apex, narrowing to a rounded base, dark green and very hairy on the nerves above, densely clothed with greenish-brown pubescence and reticulately veined beneath; the terminal leaflet about as broad as long; *stipules* minute, caducous; *stipels* subulate, subpersistent. *Racemes* 2-3 in. long, lax, short-peduncled; *pedicels* geminate; *bracteoles* large, roundish, acute. *Calyx* finely grey-downy, lowest tooth as long as the narrowly campanulate tube. *Corolla* yellow, ½ in. long. *Pod* 1-1½ in. long, rounded at the ends, viscid-pubescent greenish-brown, transverse depressions oblique. *Seeds* 3-6, their longer diameter parallel to the sutures.

Dehra Dun, Siwalik range, Rohilkhand and N. Oudh. DISTRIB. Bengal, C. and S. India, Assam and Burma; also in Java and the Philippines.

3. A. albicans, *Benth. Pl. Jungh. 243; F. B. I. ii, 215.* Cantharospermum albicans, *W. & A. Prod. 256 (excl. syn.).*

A twining shrub, with slender thinly canescent sulcate branches. *Leaves* subdigitately 3-foliolate; *leaflets* 1-2 in. long, obovate, obtuse or acute, narrowed to a subdeltoid or rounded base, firmly coriaceous, white-canescent and not reticulate-veined beneath. *Racemes* 4-12-flowered, usually shorter than the leaves; *bracts* small, round, silvery on the back, caducous. *Calyx-teeth* short, the lowest lanceolate, the upper oblong or deltoid. *Corolla* yellow, much exserted. *Pod* 1-1½ in., straight, distinctly lineate, narrowed to the base, 5-6-seeded, thinly canescent.

Bundelkhand (Edgeworth). DISTRIB. S. India and in Ceylon.

4. A. scarabæoides. *Benth. Pl. Jungh. 243; F. B. I. ii., 215.* Cantharospermum pauciflorum, *W. & A. Prod. 255; D. & G. Bomb. Fl. 73.*

A slender herbaceous twiner with densely grey-downy stems. *Leaves* 1½-2 in. long, subdigitately 3-foliolate; stipules minute, caducous. *Leaflets* obovate-oblong, obtuse or subacute, subcoriaceous, 3-nerved towards the base thinly grey-canescent above, pubescent and faintly reticu-

late-veined beneath, *petiole* ½ in. long, brownish-pubescent; *stipels* O. *Racemes* 2-6-flowered, on densely pubescent short axillary peduncles. *Calyx* densely grey-silky; teeth linear, the lowest twice as long as the tube. *Corolla* yellow, ½–¾ in. long; *keel* abruptly incurved at the tip. *Pod* straight, ¾-1 in. long, 4-6-seeded, clothed with fine spreading brown silky hairs, the transverse lines slightly oblique

Common within the area. DISTRIB. Throughout India, ascending to 5,000 ft. on the W. Himalaya; also in Malaya, China, Mauritius and Madagascar.

5. A. platycarpa, *Benth. Pl. Jungh. 243; F. B. I. ii, 216.*

A twining or trailing herb with very slender grey pubescent branches. *Leaves* 3-foliolate; *leaflets* 1-3 in. long, the terminal one distinctly stalked, roundish, acute or cuspidate-acuminate, membranous, finely pilose on both surfaces; *peduncles* shorter than the petioles, suppressed at the ends of the shoots, where the leaves also are much reduced, 1-2-flowered; *pedicels* as long as the calyx. *Calyx* densely pilose, teeth linear-setaceous. *Corolla* little exserted. *Pod* 1-1¼ in. long, straight, flat, distinctly lineate, thinly pilose, 5-7-seeded.

Saharanpur District, Saugor (Jerdon). DISTRIB. Bengal and Central Provinces, and up to 3,000 ft. on the W. Himalaya.

8. CAJANUS, DC.; Fl. Brit. Ind. ii, 217.

An erect shrub. *Leaves* 3-foliolate, gland-dotted beneath. *Flowers* racemed. *Calyx-tube* campanulate, teeth short. *Corolla* much-exserted, its petals equal in length, *keel* truncate. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* subsessile, few-ovuled; *style* long, filiform, much upcurved, *stigma* capitate. *Pod* linear, straight, narrowed at both ends, 3-5-seeded, torulose, with oblique linear depressions between the non-strophiolate seeds.—The only species.

C. indicus, *Spreng. Syst. iii, 248; W. & A. Prod. 256; F. B. I. ii, 217; Field and Gard. Crops ii, 20, t. xxxiii; DC. L'Orig. Pl. Cult. 266; Watt E. D.*; C. flavus, *DC.* C. bicolor, *DC.*; *Royle Ill. 193; F. and G. Crops i. c. t. xxxiv.* Cytisus Cajan, *Linn.*; *Roxb. Fl. Ind. iii, 325.* Vern. *Arhar* (C. bicolor), *tor* or *thur* (the yellow-fld. variety).—Pigeon-pea.

An erect shrub, 5-10 ft. high, with many sulcate silky branches. *Leaflets* oblong-lanceolate, acute, entire, densely silky beneath and indistinctly gland-dotted; *stipules* minute, soon falling. *Flowers* in loose corymbose racemes, or forming a terminal panicle; *pedicels* downy. *Calyx* ¼ in., gland-pubescent. *Corolla* three times the calyx; *standard* yellow, or (in C. bicolor) veined with red. *Pod* 2-3 in. long, finely downy, often blotched with reddish purple streaks, tipped with the lower half of the style. *Seeds* about the size of a small pea, varying in colour from yellow and red to brown or black.

Extensively grown within the area, but usually as a subordinate crop along with *tuar*, *bajra* and cotton. It is sown at the commencement of the rainy season, and occupies the ground until the following March or April. It is liable to be injured by frost. DeCandolle regarded it as having originally been introduced from Tropical Africa. Dr. Prain, however, believes that it may be indigenous in S. E. Asia. It is cultivated throughout the northen parts of India, and everywhere in the tropics. The pulse, which is extremely nutritions, is eaten by all classes of people in India It is sold either in the form of split peas (*dál*), or as a flour. The leaves afford excellent fodder.

9. DUNBARIA, W. & A.; Fl. Brit. Ind. ii, 217.

Woody or herbaceous climbers. *Leaves* 3-foliolate, distinctly gland-dotted beneath. *Flowers* racemose or axillary. *Calyx-teeth* narrow, the lowest exceeding the others. *Corolla* exserted, marcescent or caducous; *keel* usually not beaked. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* sessile or stalked, many-ovuled; *style* inflexed, filiform, beardless, *stigma* capitate. *Pod* linear, flat, not or indistinctly marked with depressed lines between the substrophiolate seeds.—Species about 12, inhabiting E. Asia, Japan and N. Australia.

D. glandulosa *Prain in Journ. As. Soc. Beng. LXVI (1897), 433.* Atylosia rostrata, *Baker in F. B. I. ii, 216.* Cajanus glandulosus *D. & G. Bomb. Fl. 73.*

A woody climber, densely clothed with short tomentum. *Leaves* long-petioled, pinnately 3-foliolate; *leaflets* 3-4 in. each way, terminating in a cuspidate point, suddenly narrowed to the base, subcoriaceous, green and glabrous above, canescent and gland-pubescent beneath, exstipellate. *Flowers* in pairs, large, yellow, in long-peduncled lax racemes overtopping the leaves; *pedicels* about ½ in. long, deflexed in fruit. *Calyx* ¾ in., broadly campanulate, sparsely bristly, teeth shorter than the tube. *Corolla* 1 in. long; *keel* broad, beaked; *standard* furnished with calli at the base. *Pod* 2½-3 in. long, linear, pointed, clothed with yellowish bulbous-based bristles, recurved, 8-10-seeded.

Sangor (Jerdon). DISTRIB. C. and N. India, Bengal, Burma and Shan States.

10. CYLISTA. Ait.; Fl. Brit. Ind. ii, 219.

A climbing shrub. *Leaves* 3-foliolate. *Flowers* racemed. *Calyx-tube* campanulate; teeth scariose, persistent, the lowest much the largest and boat-shaped, the two side-ones smaller than the two upper. *Corolla* enclosed in the calyx, *petals* equal in length; *keel* much incurved, truncate. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* subsessile, 1-ovuled; *style* long, filiform, *stigma* capitate. *Pod*

small, oblique, oblong, enclosed in the calyx.—The only species. Differs from *Rhynchosia* by its peculiar calyx.

C. scariosa, *Roxb. Pl. Corom. i, 64; Fl. Ind. iii, 320; W. & A., Prod. 259; D. & G. Bomb. Fl, 74; F. B.I. ii, 219.*

A woody climber, with slender finely-downy branches. *Leaflets* minutely stipellate, 2-4 in. long, ovate or subrhomboidal, acute, subcoriaceous, thinly grey-downy above, densely so below. *Flowers* in copious distinctly peduncled lax or dense racemes; *bracts* large, membranous, ovate, caducous; *pedicels* short, densely pubescent. *Corolla* yellowish-red, ½ in. long. *Calyx* finally 1-1½ in. long, the scariose conspicuously veined lower lip 1 in. broad.

Forests of N. Oudh (R. Thompson), Saugor. DISTRIB. Cent. Prov., W. and S. India, and in Upper Burma.

11. FLEMINGIA, Roxb.; Fl. Ind. ii. 226.

Shrubs, rarely herbs. Leaves digitately 3-foliolate or simple, gland-dotted below. *Inflorescence* various; *pedicels* very short, not bracteolate. *Calyx-tube* short; teeth narrow, acuminate, the lowest often the longest. *Corolla* little or not exserted, *petals* equal in length, *keel* obtuse or slightly rostrate. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* subsessile, 2-ovuled; *style* filiform, beardless, *stigma* capitate. *Pod* oblong, turgid, small, usually 2-seeded. *Seeds* not strophiolate, the funicle central.—Species about 25, of which 3 are found in Tropical Africa, and the rest are Asiatic.

The following arrangement of the species occurring within the area of this flora has been drawn up, for the most part, in accordance with Dr. Prain's Notes on Leguminosæ, published in the Journ. As. Soc. Beng. LXVI, part ii, No. 2 (1897).

Leaves simple, racemes exceeding the leaves; bracts large, membranous, persistent, each enfolding a small cluster of flowers.	
Leaves oblong, rounded at the base, axis of racemes zigzag.	
Bracts about 1 in. long; lateral nerves of leaflets 8-10 pairs, all subequal	1. *F. strobilifera.*
Bracts smaller; lateral nerves of leaflets 4-6 pairs, the basal pair longest	2. *F. bracteata.*
Leaves suborbicular, cordate, acuminate; axis of racemes straight	3. *F. Chappar.*

Leaves simple or 3-foliolate ; flowers in loose panicled racemes, which exceed the leaves; bracts small, caducous.
- Leaves 1-foliolate, bracts boat-shaped . 4. *F. paniculata.*
- Leaves 3-foliolate ; bracts minute, linear 5. *F. lineata.*

Leaves digitately 3-foliolate ; flowers in spike-like axillary racemes, which fall short of the leaves ; bracts linear or lanceolate.
- Bracts rigid, exceeding the buds, subpersistent . . . . . 6. *F. stricta.*
- Bracts neither rigid nor protruded, deciduous.
  - Erect woody undershrubs, with rather tall stems.
    - Racemes condensed, often shorter than the petioles.
      - Leaflets large, broadly oblanceolate . . . 7. *F. congesta.*
      - Leaflets smaller, narrowly lanceolate . . . . 8. *F. prostrata.*
    - Racemes elongated, exceeding the slightly winged petioles . 9. *F. semialata.*
  - Low shrubs, with a woody subterranean stem, calyx and pods beset with garnet-coloured glands.
    - Branches trailing, flowers in short dense long-peduncled racemes . 10. *F. procumbens.*
    - Branches erect, flowers in dense elongated racemes . . . 11. *F. nana*

Leaves digitately 3-foliolate, flowers in compact heads surrounded by large persistent bracts . . . . . 12. *F. involucrata.*

1. F. strobilifera. *R. Br. in. Ait. Hort. Kew, ed. II, iv, 350 ; W. & A. Prod. 243 ; D. & G. Bomb. Fl. 75 ; Brand. For. Fl. 143 ; F. B. I. ii, 227 (typical form only) ; Watt E. D. Prain in Journ. As. Soc. Beng. LXVI, part ii, 42 & 437.* Hedysarum strobiliferum, *Linn. ; Roxb. Fl. Ind. iii, 350.*

An erect shrub, 5-10 ft. high, with slender terete branches velvety towards their tips. *Leaves* 3-4 in. long, oblong or ovate-lanceolate, acute, rounded at the base ; lateral nerves 8-10 pairs ; *petioles* ½ in ; *stipules* lanceolate, scarious. *Racemes* terminal, 3-6 in. long, the slender zigzag rachis rusty—pubescent ; *bracts* 1 in. long, shortly stalked, deeply

cordate, usually cuspidate at the apex. *Calyx-teeth* lanceolate, pilose, exceeding the tube. *Corolla* yellowish or greenish-white. *Pod* about ½ in., oblong, turgid, finely downy, 2-seeded.

Dehra Dun and Siwalik range, N. Oudh, Bundelkhand. DISTRIB. From Sind, Rajputana and Bengal to S. India and Ceylon; also in Burma, the Andaman and Nicobar Islands and Malay Pen., extending to Siam and Java. It flowers from the latter part of the rains till Nov. The roots are used medicinally by the Santals.

2. F. bracteata, *Wight Ic. 263; Prain in Journ. As. Soc. Beng. LXVI. 437.* F. strobilifera, *R. Br., var.* bracteata *in F. B. I. ii, 227.*

Similar in many respects to the preceding, but the lateral nerves of the leaves are fewer, the basal pair being longer, more prominen and more oblique than the others, the racemes are more copiously and densely panicled, and the bracts are smaller and usually emarginate rather than cuspidate at the apex

Siwalik range, N. Oudh, sub-Himalayan tracts of Garhwal and Kumaon and Bundelkhand. DISTRIB. C. and S. India, Bengal, Sikkim, and in Upper Burma, also in Yunan. Flowers during the cold season.

3. F. Chappar, *Buch.-Ham. in Wall. Cat. 5757; Brand. For. Fl. 143; F. B. I. ii, 227.* Vern. *Sálpán, chánchra* (E. Dun), *Kasrawa* (Oudh).

Habit and inflorescence like that of the two preceding species. *Branches* terete, with a thin coating of appressed hairs. *Leaves* about as broad as long, 2-4 in each way, cordate at the base, acuminate or cuspidate at the apex, glabrous above, minutely grey-downy below, subcoriaceous. *Raceme* often panicled, its axis straight; *bracts* firm, broader than long, deeply emarginate. *Calyx-teeth* as long as the tube.

Dehra Dun, N. Oudh and Gorakhpur, usually in damp localities. DISTRIB. Bengal, Behar, S. India and Burma. Flowers Aug.-Oct. The roots are used medicinally.

4. F. paniculata, *Wall. Cat. 5759; F. B. I. ii, 227.*

An erect shrub, 4-6 ft. high, with finely downy slender terete branches. *Leaves* simple; *leaflets* 3-6 in. long, cordate-ovate, cuspidate, thin, not plicate, glabrous except on the veins beneath; *petiole* 1 in. or more; *stipules* minute, caducous *Flowers* mostly in a terminal paniole, with densely grey-downy branches; axillary racemes simple or fascicled; *bracts* boat shaped, as long as the calyx, scarious, pilose, caducous. *Calyx* densely grey-downy; teeth lanceolate, acuminate; tube very short. *Corolla* reddish, slightly exserted; *keel* beaked. *Pod* ½ in. long, oblong, finely downy, 2-seeded.

Dehra Dun and N. Oudh. DISTRIB. Kumaon to Sikkim, at low elevations, Chota Nagpur, Upper Burma and Shan Hills.

5. F. lineata, *Roxb. Hort. Beng. 56; Fl. Ind. iii, 341; W. & A. Prod. 242; Brand. For. Fl. 143; F. B I. ii, 228.*

An erect shrub with the ultimate branches angular and grey-canescent. *Leaves* 3-foliolate; *leaflets* 1-3 in. long, oblanceolate-oblong, obtuse or

slightly cuspidate, deltoid at the base, 3-nerved and deeply plicate, rigidly subcoriaceous, grey-canescent on both surfaces; *stipels* 0; *petiole* ½-2 in.; *stipules* rather small, lanceolate, scarious, sub-persistent. *Flowers* in copious axillary and terminal panicled racemes, crowded towards the ends of the branches; *pedicels* very short; *bracts* minute, linear. *Calyx-teeth* lanceolate. *Corolla* little exserted, reddish, *keel* beaked. *Pods* ¾-1 in., finely downy, and covered with mealy glands, 2-seeded.

Northern Oudh. DISTRIB. Throughout India from the base of the Himalaya to Ceylon; also in Burma, Siam, the Malay Islands and in N. Australia. Flowers during the rainy and cold seasons.

6. **F. stricta.** *Roxb. Hort. Beng. 56; Fl. Ind. iii, 342; W. & A. Prod. 242; F. B. I. ii, 228.*

A tall shrub with woody and distinctly 3-quetrous branches clothed with scattered appressed hairs. *Leaves* digitately 3-foliolate; *leaflets* 6-12 in. long, oblong, acuminate, thinly subcoriaceous, glabrous above, hairy on the veins beneath; *petiole* 4½-5 in. long, 3-quetrous, sulcate, not winged; *stipules* 2 in. long, lanceolate, rigidly scarious, caducous. *Racemes* 2-4 in. long, dense, oblong-cylindrical, often fascicled; *bracts* linear, firm, much exceeding the buds; *pedicels* very short. *Calyx* nearly ½ in. long, teeth linear, the lowest much longer than the others. *Corolla* as long as the lowest calyx-tooth; *keel* obtuse. *Pod* about ½ in. long, glabrescent.

Dehra Dun, in swampy ground, also in Oudh. DISTRIB. Himalaya, at low elevations, from Kumaon to Sikkim, C. and S. India, Sylhet, Assam, Burma, extending to China. Flowers during March and April.

7. **F. congesta,** *Roxb. Hort. Beng. 56; Fl. Ind. iii, 340; W. & A. Prod. 241; D. & G. Bomb. Fl. 75; Brand. For Fl. 143; F. B. I. ii. 228 (excl. syn. F. angustifolia, Roxb. and all vars.) Watt E. D. (in part); Prain in Journ. As. Soc. Beng. LXVI, 43 & 440.* Vern. *Bara sálpán, banchui,* (Dehra Dun).

An erect woody shrub, 4-6 ft. high, with slender triangular sulcate branches, silky towards their tips. *Leaves* 6-9 in. long, 3-foliolate; *petioles* 2½-3½ in., hardly winged; *stipules* ¼ in long, linear, caducous; *leaflets* 3-5 in. long, oblanceolate, acute, the terminal one cuneate and the lateral obliquely rounded at the base, subcoriaceous, dark green and puberulous above, the lower surface with minute ruby-coloured glands and silky hairs on the veins; lateral nerves 5-7 pairs, the lowest pair long and very oblique; *stipules* 0. *Racemes* dense, axillary, shorter than the petioles, usually fascicled in the lower axils; *bracts* lanceolate, membranous, silky outside, deciduous. *Calyx* densely silky; teeth lanceolate, the lowest exceeding the others. *Corolla* with purple wings; *standard* white striped with pink. *Pod* oblong, ½ in. long, tomentose, 2-seeded.

Dehra Dun, common in sál forests. DISTRIB. Throughout the hotter parts of India, and in the Malay Pen. and Java. Flowers April—Aug.

Under *F. congesta* in the Fl. Brit. India are included several other plants, which Roxburgh in his Fl. Indica has treated as distinct species, *e.g. F. prostrata, semialata, procumbens* and *nana*. As they are easily recognized in the field, I agree with Dr. Prain in keeping them separate; and although *F. prostrata* and *F. nana* have, in some respects, the appearance of degenerate forms of *F. congesta*, yet they surely have as much right to specific rank as *Grewia sapida, Combretum nanum, Erythrina resupinata* and other such plants, which have evidently assumed a dwarf habit and other well-marked characters whilst adapting themselves to the peculiar conditions under which they now grow.

VAR. viridis, *Prain l.c.* F. semialata, *Wall.* (*not of Roxb.*). F. semialata *var.* viridis, *Kurz*; *petioles* distinctly winged, *leaves* thinner and pale-green.—Kheri (N. Oudh) Duthie's collector. DISTRIB. Behar, Tirhut, Burma and Shan Hills.

8. F. prostrata, *Roxb. Fl. Ind. iii, 338; Prain in Journ. As. Soc Beng. l c.* F. angustifolia *Roxb. l. c. 341.* F. congesta *Bak. in F. B I. ii, 298 (in part) and* F. congesta *var.* semialata, *Bak. (in part) l. c., but not F. congesta* or *F semialata of Roxb.*

Stems scarcely any; *branches* erect or somewhat procumbent, up to 2½ft. 3-quetrous, downy when young *Leaves* 3-foliolate; *leaflets* 3-4 in. long, narrowly lanceolate, lateral obliquely so, obtuse or acute, 3-nerved, villous beneath; *petiole* 1-2 in., sharply 3-quetrous, widening upwards; *stipules* lanceolate, cuspidate, ½ the length of the petioles, villous, caducous *Racemes* solitary and axillary, dense, often exceeding the petioles, villous; *bracts* silky, caducous *Flowers* small, yellow tinged with purple. *Calyx* clothed with long white hairs; teeth linear-lanceolate, the lower one twice as long as the others. *Pod* oval, downy and gland-dotted *Seeds* round, dark-brown spotted with grey

Forests of Dehra Dun Rohilkhand, N. Oudh and Gorakhpur. DISTRIB. Bengal, Assam, Shan Hills, Martaban, and China. In N. Oudh it is usually found in a dwarfed condition by reason of periodical fires.

9. F. semialata. *Roxb. Hort. Beng. 56; Fl. Ind. iii, 340; Don. Prod. 242; W. & A. Prod. 241; Prain in Journ As. Soc. Beng. l.c. 441* F. congesta *var.* semialata *Bak. in F. B. I. ii, 229 (excl. syn. F prostrata, Roxb.).*

Very similar in habit and foliage to *F. congesta*, from which it can easily be distinguished by the winged petioles, and by the lax elongated panicled racemes, which often exceed the leaves The glands on the under surface of the leaflets are much less conspicuous *Seeds* small round, smooth, shining and black

Dehra Dun and Saharanpur Siwaliks DISTRIB Himalaya from Chamba to Bhutan, up to 5,000 ft., Khasia, Naga and Manipur Hills, and from Bengal to S. India and Ceylon. Flowers March to May

10. F. procumbens. *Roxb. Fl. Ind. iii, 338; Wight Ic. 409.*

Branches trailing, up to 2 ft. long, 3-sided, villous *Leaves* 3-foliolate, *leaflets* ½-¾ in. long, lateral obliquely oval, the terminal one obovate,

villous beneath, prominently veined: *stipules* villous, caducous. *Flowers* small, in short dense long-peduncled axillary and usually solitary racemes; *pedicels* short; *bracts* obtuse, caducous. *Calyx* silky and with garnet-coloured glands outside. *Corolla* lilac or rose with purple veins. *Pods* sessile, oval, beset with garnet-coloured glands. *Seeds* globose, grey mottled with brown.

Rohilkhand, N. Oudh, Gorakhpur and Nepal Terai (Duthie's collectors). The red glands on the calyx and pods are very conspicuous. For an account of the 'waras' dye obtained from similar glands found on on African species (*F. rhodocarpa*) the reader is referred to Dr. Watt's Dictionary under "Flemingia congesta."

11. F. nana, *Roxb. Hort. Beng. 56; Fl. Ind. iii, 339; Wight Ic. 339 (copied from that of Roxburgh); Prain in Journ. As. Soc. Beng. l. c. 441.* F. congesta *var.* nana, *Bak. in F. B. I. ii, 229 (but not as described), excl. syn. F procumbens, Roxb.*

Suffruticose. Whole plant 6-8 in. only, with hardly any stem. *Leaves* 3-foliolate, long-petioled; *leaflets* 1-3 in. long, 3-nerved, downy, the lateral obliquely oblong, terminal one obovate; *petioles* often longer than the leaves, winged; *stipules* ensiform, ¼ in. long. *Racemes* crowded, elongate, shortly peduncled; *bracts* lanceolate. *Flowers* small, pale-green tinged with pink and with deeper stripes. *Calyx* and *pods* covered with minute viscid bright red glands. *Pods* about ½ in. long. *Seeds* small, round, brown.

Discovered near Hardwar on the Ganges by Colonel Hardwicke, by whom seeds were given to Dr. Roxburgh, Kheri district of N. Oudh (Duthie's collector), Saugor (Jerdon). DISTRIB. Behar, Chota Nagpur, Kanara. A remarkable-looking plant, having all the appearance of a degenerated form of some much larger species, though different in many other respects from any existing one. In some specimens the size of the leaves is out of all proportion to that of the plant. The foliage and elongated racemes resemble most nearly those of F. semialata, and in both the petioles are winged.

12. F. involucrata, *Benth. Pl. Jungh. 246; F. B. I. ii, 229.* F. capitulata, *Royle Mss.*

An erect shrub, 2-4 ft. high, with slender terete zigzag woody finely downy branches. *Leaves* digitately 3-foliolate; *stipules* large, scarious caducous; *petiole* ½-¾ in.; *leaflets* 2-3 in. long, oblong or lanceolate, narrowed at both ends, subcoriaceous, glabrous above, grey and finely-downy below. *Flowers* in compact heads, terminal and axillary, surrounded by many lanceolate acuminate scarious persistent bracts, which are ½ in. long. *Calyx* ⅓-½ in. long, clothed with long grey hairs; teeth very long, the two upper subconnate. *Corolla* included, *keel* obtuse. *Pod* small, oblong, not exserted, downy, 1-seeded.

Siwalik range (Falconer), Saugor (Jerdon). DISTRIB. Assam, Sikkim, Burma; also in Bengal and in C. and W. India, extending to Java. Flowers at the beginning of the cold season.

12. ERIOSEMA, DC.; Fl Brit. Ind. ii, 219.

Shrubs or herbs, mostly suberect, with 1-3-foliolate gland-dotted leaves *Flowers* racemed or axillary. *Calyx* campanulate; teeth 5, as long as the tube. *Corolla* distinctly exserted; limb of standard roundish, auricled at the base, wings and slightly beaked keel shorter. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* sessile, 2-ovuled; *style* filiform, glabrous, *stigma* capitate. *Pod* oblong, turgid, 1-2-seeded; *seeds* oblique, the funicle attached to the extremity of a linear hilum. Species about 70, mostly Trop. African and American.

E. chinense, *Vog. Nov. Act. Nat. Cur. xix, Suppl. i, 31; F. B. I. ii, 219; Watt E. D.* Crotalaria tuberosa, *Buch.-Ham. in Don. Prod. 241.* Pyrrotrichia tuberosa, *W. & A. Prod. 238.*

An erect undershrub 1-1½ ft. high, with a small tuberous woody root-stock. *Stems* slender, branching near the base, densely pubescent. *Leaves* 1-2 in. long, 1-foliolate, shortly petioled, linear oblong or lanceolate, subcoriaceous, greenish with a few appressed hairs above, glaucous and densely grey-tomentose beneath, the veins rusty-tomentose; *stipules* linear, scarious, persistent, *stipels* minute. *Flowers* 1-2, in the axils of the upper leaves, subsessile or on a common pedicel; *bracteoles* obsolete. *Calyx* densely pilose. *Corolla* twice the calyx, yellow, blackish when drying; *standard* hairy outside. *Pod* oblong, clothed with long spreading rufous hairs.

Saugor (Vicary) DISTRIB. W. Himalaya from Garhwal eastward to Khasia and Assam, up to 6,000 ft.; also in Chota Nagpur, Ceylon, and the Malay Pen., extending to China, the Philippines and N. Australia. The tuberous roots are sometimes eaten.

13. RHYNCHOSIA, Lour.; Fl. Brit. Ind. ii, 220.

Twining or erect herbs or shrubs *Leaves* pinnately 3-foliolate, gland-dotted beneath, usually without stipels; *stipules* and *bracts* caducous. *Flowers* axillary or racemed. *Calyx-tube* short; teeth equalling or much exceeding it, usually not accrescent, the upper often more or less connate. *Corolla* included or exserted; *keel* incurved, not distinctly beaked. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* subsessile, usually 2-ovuled; *style* long, filiform, much incurved; *stigma* capitate. *Pod* round or oblong, flattish or turgid. *Funicle* almost central on the hilum.—Species about 100, found in the tropics of both Hemispheres.

A trailing herb, seeds with a waxy arillus . 1. *R. capitata.*
Twining herbs, seeds with no arillus.
  Leaflets small, nearly glabrous . . 2. *R. minima.*
  Leaflets large, softly pubescent.
    Stipules lanceolate, subpersistent 3. *R. sericea.*
    Stipules minute, deciduous . . 4. *R. bracteata*

1. R. capitata, *DC. Prod. ii,. 386; W. & A. Prod. 237; Prain in Journ. As. Soc. Beng. lxvi, pt. ii, 435. R. aurea, F. B. I. ii, 221 (in part).*

An annual with slender wide-trailing stems, clothed with fine spreading hairs *Leaflets* roundish, with a cuneate base; *petioles* about as long as the leaves *Racemes* many-fld., ultimately becoming twisted and forming round heads of flowers; *peduncles* longer than the leaves, with a slender leafless and somewhat abortive young shoot springing from about the middle of it. *Calyx-segments* long. subulate, forming a short hooked point to the flower-buds. *Corolla* yellow, the standard not striped with purple *Pod* marked with very delicate close transverse veins, and terminated by the hooked base of the style. laxly pilose, 2-seeded.

Bundelkhand (Vicary). DISTRIB W. Himalaya in the Kangra Valley, Punjab Plain, Behar and in C and S. India

2. R. minima, *DC. Prod. ii, 395; F B. I. ii, 223; Watt E. D. R. medicaginea, DC.; W & A. Prod 239; Royle Ill. 191; D. & G. Bomb. Fl 74.* R. microphylla, *Wall.; Royle Ill 191* R. nuda, *DC.; W. & A. l.c.*

Usually a twining annual, nearly or quite glabrescent. *Stems* very slender *Stipules* minute, lanceolate, caducous. *Leaflets* ½-1 in and as broad as long, obtuse. deltoid in the lower half, conspicuously gland-dotted beneath, the end one distinctly stalked. usually exstipellate.. *Racemes* usually exceeding the leaves, short peduncled, 6-12-fld.; *bracts* minute, linear. *Calyx* pubescent; lowest tooth setaceous, twice the tube. *Corolla* yellow, exserted *Pod* about ½ in. long, glabrescent, turgid, slightly recurved, usually 2-seeded.

Abundant within the area. DISTRIB. Throughout India, and on the Himalaya up to 4,000 ft.; also in Ceylon and Burma. Cosmopolitan in the tropics.

3. R. sericea, *Spanoghe in Linnæa XV, 195; F. B. I. ii, 225.* Dolichos tomentosus, *Roth; W. & A. Prod. 249.*

Stems woody, slender, wide-climbing, clothed with soft short spreading grey glandular hairs. *Leaflets* softly pubescent and pale-green on both surfaces, deltoid at the obtuse or sub-acute apex, the lower half narrowing suddenly to a rather rounded base, sometimes stipellate, the end-one distinctly stalked; *stipules* lanceolate, ¼-⅜ in., subpersistent. *Racemes* many-fld., about 12 in. long including the peduncle; *pedicels* shorter than the calyx; *bracts* lanceolate, silky, exceeding the buds. *Calyx* ¼-⅜ in., densely grey-silky; upper teeth deltoid-cuspidate, shorter than the tube. *Corolla* exserted; *standard* dark purple inside, distinctly auricled silky on the back. *Pod* 1-1¼ in. long, finely pubescent, turgid. 2-seeded, rather recurved, tipped with the long persistent base of the style.

Siwalik range (Falconer), Gonda dist. of Oudh (Duthie's collector), Ajmer, Saugor. DISTRIB. Bengal, Central and W. Himalaya up to 6,000 ft., and on the hills of C. and S. India.

4. R bracteata, *Benth. ex Bak. in Fl. Brit. Ind. ii, 225; Prain in Journ. As. Soc. Beng. LXVI, 436.*

Branches usually twining, woody, clothed with short persistent canescent not glandular pubescence. *Stipules* minute, caducous; *leaflets* 2-4 in. long and broad, roundish or rhomboidal, with cuspidate apex, subcoriaceous, green and thickly downy above, densely grey-downy beneath, exstipellate. *Racemes* distinctly pedunculed and much exceeding the leaves; *pedicels* shorter than the calyx. *Calyx* ¼-⅓ in., densely, downy; lower tooth linear, exceeding the tube but shorter than the corolla. *Corolla* ½ in.; *standard* canescent outside. *Pod* 1-1½ in. long, turgid, 2-seeded, narrow in the lower half, minutely downy.

Near Benares (Madden), Gorakhpur forests (Duthie's collector). DISTRIB. Chanda dist. in C. Provs. and in Burma.

14. PHASEOLUS, Linn.; Fl. Brit. Ind. ii, 200.

Twiners, usually herbaceous, with 3-foliolate stipellate leaves. *Flowers* in copious axillary racemes; *bracts* generally small and deciduous; *bracteoles* usually conspicuous and persistent. *Calyx* campanulate; the lowest tooth usually longer than the rest, and the two uppermost subconnate. *Corolla* much exserted, the keel prolonged into a very long beak and forming a more or less complete spiral. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* sessile, many-ovuled; *style* filiform, twisted round with the keel, conspicuously bearded down the side below the very oblique stigma. *Pod* linear, rarely oblong, sub-terete or subcompressed, more or less distinctly septate between the seeds.—Species 60 or more, mostly tropical, and many of them widely cultivated.

The following account of the species, as represented within the area of this flora, has been prepared in accordance with the views of Dr. Prain, who in his valuable Notes on the Leguminosæ, published in Vol LXVI of the Journ. of the Asiatic Society of Bengal, has helped very materially towards a better understanding of this difficult genus. The transposition of the name 'P. Mungo' for *urd*, and that of 'P radiatus' for *mung*, may appear to the unbotanical reader as an obvious step in the direction of rendering confusion more confounded, yet the laws of botanical nomenclature necessitate the adoption of the names given to these two plants by Linnæus, who unfortunately applied the name 'Mungo' to a variety of *urd*.

Stipules small; basifixed; pod compressed.

Pod broad and scimitar-shaped, 2-4-seeded	1. *P. lunatus.*
Pod linear straight, 4-6-seeded . .	2. *P. vulgaris.*

Stipules inserted above their bases, pod cylindrical
- Branches usually not twining.
  - Pod glabrous or nearly so.
    - Stipules large, oval . . . 3. *P. trilobus.*
    - Stipules small, linear-lanceolate . 4. *P. aconitifolius.*
  - Pod hairy.
    - Leaves dark-green, pod spreading (*Mung*) . . . . . 5. *P. radiatus.*
    - Leaves yellowish-green, pod ascending or sub-erect, seeds larger. (*Urd*) 6. *P. Mungo.*
- Branches twining, pod hairy . . 7. *P. sublobatus.*

1. P. lunatus, *Linn. Sp. Pl. 724; Roxb. Fl. Ind iii. 287; W. & A. Prod. 244; F. B. I ii, 200; DC. L'Orig. Pl Cult. 275; Watt E.D.* – Lima Bean.

A tall biennial twining plant, bearing racemes of many small greenish-yellow flowers. Bracteoles minute. *Petals* hairy outside *Pods* 2-3 in. long, flat, the upper suture recurved, the lower broadly rounded. *Seeds* large, 2-4, white or mottled.

This, according to DeCandolle, is a native of Brazil, and was probably introduced into India from the Mauritius. It is cultivated throughout India, and everywhere in the tropics. The young pods are sliced and cooked like French beans; and at a later stage the large flat ivory-like seeds are eaten as a vegetable

2. P. vulgaris, *Linn. Sp. Pl. 723; Roxb. Fl. Ind. iii, 287; W. & A. Prod. 243; F. B. I. ii, 200; DC. L'Orig. Pl. Cult. 270; Watt E.D.*— French Bean, or Kidney Bean.

A suberect or twining annual, glabrous or nearly so. *Racemes* lax, few-flowered; *bracteoles* ovate or roundish, persistent. *Flowers* larger than those of the preceding, white rose or lilac. *Petals* glabrous outside. *Pods* 4-6 in., linear, straight, turgid, glabrous.

Cultivated in gardens all over India for the sake of its young green pods. It is also grown in many other parts of world, both in tropical and temperate regions. During the Tirah Expedition in 1897 large quantities of the seed of this plant were found amongst the hidden stores of grain. Although not known anywhere in a wild state, it is believed to have originated in America. Many varieties are now in cultivation, and especially of the dwarf kind.—The Scarlet Runner (*P. multiflorus*) is a native of Mexico. It is also grown to a certain extent in N. India, but thrives best on the hills.

3. P. trilobus, *Ait. Hort. Kew, ed. I. iii, 30; Roxb. Fl. Ind. iii, 299; W. & A. Prod. 246; D. & G. Bomb. Fl. 71; F. B. I. ii, 201; DC. L'Orig. Pl. Cult. 277; Watt E. D.*

Annual or perennial. *Stems* slender, trailing, glabrous or slightly hairy. *Stipules* large, oval. *Leaflets* 1-2 in long, more or less deeply 3-lobed, with the central division spathulate, glabrous or nearly so. *Racemes*

capitate, on peduncles which are usually longer than the leaves; *bracteoles* ovate, *pedicels* very short. *Flowers* small, yellow. *Calyx* campanulate, deltoid. *Pod* 1-2 in., subcylindrical, glabrous, recurved, 6-12-seeded.

Fairly common within the area, and often on the edges of cultivated ground and near river-banks. DISTRIB. On the Himalaya, up to 7,000 ft. and southward to Ceylon; also in Burma, the Malay Islands, Afghanistan, Abyssinia and Nubia. In India it is sometimes cultivated as a mixed crop for fodder purposes, and by the poorer classes of people for its grain.

4. P. aconitifolius, *Jacq. Obs. Bot. iii. 2, t. 52; Roxb. Fl. Ind. iii, 299; W. & A. Prod. 247; Royle Ill. 190; F. B. I. ii, 202; F. & G. Crops I, 41, t. xi; DC. L'Orig. Pl. Cult. 276; Watt E.D.*—Vern. *Moth.*

Stems slender, suberect or diffuse, slightly hairy. *Stipules* small, narrowly lanceolate. *Leaflets* deeply 3-lobed, the central lobe ligulate. *Racemes* capitate, *peduncles* hairy; *bracteoles* linear, twice as long as the calyx, their setaceous ciliated tips protruding beyond the buds. *Flowers* minute. *Pods* stouter than those of the preceding, and with larger seeds.

Largely grown within the area as a rainy-season crop; also throughout India, from the Himalaya to Ceylon. In the Upper Gangetic Plain it is usually sown on very poor land either by itself, or along with *bajra* (Pennisetum typhoideum). The grain is chiefly used as a fattening food for cattle and horses, and the whole plant is regarded as a valuable kind of fodder.

5. P. radiatus, *Linn. Sp. Pl. 725; Prain in Journ. As. Soc. Beng. LXVI, 422.* P. Mungo, *Roxb. Fl. Ind. iii, 292 (not of Linn.); W. & A. Prod. 246; Royle Ill. 190; F. B. I. ii, 203; F. & G. Crops I, 37, t. ix; DC. L'Orig. Pl. Cult. 277. Watt E.D.*—Vern *Mung.* (Green gram).

A much-branched suberect annual, 1-2 ft. high, clothed with long deciduous silky hairs. *Stipules* ¼-½ in., attached near the base. *Leaves* dark-green; *leaflets* 2-4 in. long, roundish, acute or subobtuse, deltoid or rounded at the base, with appressed pubescence on both sides. *Racemes* capitate, shortly peduncled. *Flowers* about ½ in. long, yellow. *Pods* 1½-2½ in. long, somewhat spreading, clothed with long silky hairs. *Seeds* rather small, 10-15, usually green.

Mung is cultivated as a rainy-season crop in all parts of the area. It is also extensively grown all over India, and throughout the tropics of the Old World. There are three distinct varieties, which are distinguished by the colour of their seeds. *Harri mung*, or the green-seeded kind, is the one most commonly grown in the Upper Gangetic Plain, and being regarded as a native of India, it has acquired the name of var. typica. *Sona mung*, which has yellow seeds, is var. *aurea* (P. aureus, Roxb. Fl. Ind. iii, 297). It is a doubtful native of this country. The third variety, *grandis*, with black seeds, is the P. Max. of Roxb. (lc. 295), and

is known under the name of *Krishna mung*. It is undoubtedly an introduction and probably from China. The *mung* of the Upper Gangetic Plain is invariably sown as a mixed crop in fields of millet or cotton. Excessive rainfall is injurious to it, but in seasons of scanty rainfall, it comes in as a very valuable subordinate crop. The grain is very nutritious, and is much eaten in the form of *dál*. The stalks and leaves, though not so valuable as those of *moth*, are in Upper India much used as fodder. The flour of green gram is said to be an excellent substitute for soap.

6. P. Mungo, *Linn Mant.i, 101; Prain in Journ. As. Soc. Beng. LXVI, pt. ii, 50 & 423* P. Wightii, *W., & A. Prod 245.* Vern. *Tikari.* Stems scandent or subscandent, seeds black. This is the typical and wild form of *urd* as named by Linnæus; and, in the opinion of Dr. Prain, may not be varietably distinct from the next.

Form 2. Roxburghii; *Prain. l.c* P. radiatus, *Roxb. Fl. Ind. iii, 296 (not of Linn.); Royle Ill. 190.* P. Roxburghii, *W. & A. Prod. 246.* P. Mungo, *var.* radiatus, *F. B. I. ii, 303 (in part); Watt E.D.* Vern. *Urd, másh-kalai.*

Stems longer and more trailing than those of the *mung* (P. radiatus); whole plant much more hairy with reddish-brown pubescence, which gives the foliage a lighter tint; *leaves* larger; the *pods* are nearly erect, very hairy, and with fewer seeds, which are larger and longer than those of *mung*, and usually dark-brown, and sometimes of a dull greenish-grey colour.

Urd is very largely grown in the Upper Gangetic Plain, especially in the Meerut and Rohilkhand divisions. It is the most highly valued of all the *Phaseolus* pulses. Two distinct kinds are cultivated, the one with large black or dark-brown seeds ripens in August and September, the other with rather smaller greenish seeds ripening in October and November. Both prefer rather a heavy class of soil. It is generally sown as a subsidiary crop, but sometimes alone. Like *mung* it is liable to suffer when the rainfall is excessive. The grain is often given as a fattening food to cattle and horses, and the straw is considered to be an excellent fodder. The seed is the reputed origin of the weight known as *masha*, twelve of which go to the tola, 180 to one pound.

7. P. sublobatus, *Roxb. Hort. Beng. 54; Fl. Ind. iii, 298; Prain in Journ. As. Soc. Beng. LXVI, pt ii, 423.* C. trinervius, *Heyne; W. & A. Prod. 245; D. & G. Bomb. Fl 71; F. B I. ii, 203; Watt E. D.*—Vern. *Gora-mung* (Beng.).

Annual or perennial. *Stems* twining, 3-5 ft. long, densely clothed with long spreading reddish hairs. *Leaflets* 2-4 in. long, ovate, acute, entire or slightly lobed, dark-green, persistently pilose on both surfaces. *Racemes* 6-12 fld., on long and very hairy peduncles. *Corolla* greenish-yellow or reddish, 3-4 times the calyx. *Pods* 2-2½ in. long, 10-15-seeded, densely silky at first. *Seeds* dark-grey, separated by membranous partition.

Dehra Dun and Siwalik range. DISTRIB. Kumaon up to 4,000 ft., Behar Mt. Abu, Konkan and south to Ceylon; also in Arracan. Closely allied to the two preceding; and as Dr. Prain suggests, it may represent the wild stock from which both of these cultivated plants were originally derived. The grain is nutritious, and is said to be used to a large extent by the people of the Deccan in times of famine.

VAR. setulosa, *Prain in Journ. As. Soc. Beng. l c.* P. setulosus, *Dalz. in Kew Journ. ii, 33; F. B. I l.c.* (*under P. Mungo var. radiatus*). *Flowers* smaller: hairs on stems and pods grey—Bundelkhand (Edgeworth). DISTRIB. Konkan and W. Deccan.

15. VIGNA, Savi., Fl. Brit. Ind. ii, 204.

Twining herbs or shrubs with pinnately 3-foliolate stipellate leaves *Flowers* in copious axillary racemes; *bracts* small, deciduous; *bracteoles* conspicuous. *Calyx* campanulate; teeth short or long, the upper often connate *Corolla* much exserted; *keel* truncate or prolonged into a beak, not spirally twisted. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* sessile, many-ovuled; *style* long, filiform, bearded along the inner face below the oblique stigma. *Pod* linear, subterete, subseptate.—Species 40 or 50, mostly tropical.

Keel not beaked	1. *V. Catiang.*
Keel prolonged into a distinct beak . . .	2. *V. vexillata.*

1. V. Catiang, *Walp. in Linnæa xiii, 533; F. B. I. ii, 205; F. & G. Crops ii. 12, t.t XXIX & XXX.* Dolichos Catiang, *Linn.; Roxb. Fl. Ind. iii, 303; Royle Ill. 190.* D. sinensis, *Linn.; Roxb. l. c. 302; W. & A. Prod. 250.* Vern. *Lobia, rawás, rausa, sonta.*

A suberect or twining annual, with glabrous stems. *Stipules* ½-¼ in attached above the base, ovate-lanceolate, persistent. *Leaflets* 3-6 in. long, entire or slightly lobed, broadly or narrowly ovate, the lateral ones obliquely so. *Flowers* few, in subcapitate racemes; *peduncles* often exceeding the leaves; *bracts* attached above the base, deciduous. *Calyx* under ¼ in., deltoid-cuspidate. *Corolla* yellow or reddish, twice the calyx. *Pod* 4-24 in. long, slightly depressed between the seeds

Lobia is extensively cultivated throughout the area for its grain during the rainy season, and is usually sown along with millets and other crops. Though somewhat resembling *mung* and *urd*, it may easily be distinguished by its smooth stems, foliage and pods. The form *sinensis* differs from the type in having twining stems, larger leaves and longer pods. The green pods of a long-podded form are often eaten as a substitute for French beans, but are very inferior The seeds vary in colour, the white kinds being considered the best. The stalks and leaves are used as fodder. Though not known anywhere in its truly wild state, it probably originated in the Eastern Hemisphere.

2. V. vexillata, *Benth. in Mart. Fl. Bras. XV, 194; F. B. I. ii, 206.* Phaseolus vexillatus, *Linn.* P. sepiarius, *Dals.; D. & G. Bomb. Fl. 72.*

A perennial herb with a fusiform root. *Stems* twining, glabrescent when mature. *Stipules* lanceolate, basifixed. *Leaflets* 2-6 in. long, broadly ovate or lanceolate, acute or acuminate, rounded at the base, membranous, clothed with appressed pubescence. *Flowers* 2-4, on very long peduncles; *bracteoles* setaceous. *Calyx* about ¼ in. long, silky; teeth linear-lanceolate, as long as the tube. *Corolla* an inch or more in length, reddish-purple; standard 1-1¼ in broad. *Pod* 3-4 in., slender, glabrescent when mature, 10-15-seeded.

Dehra Dun and the Siwalik range. DISTRIB. Plains of Punjab and Bengal; abundant up to 8,000 ft. on the Himalaya from Simla to Kumaon, and on the Khasia Hills; also on the hills of S. India and in Ceylon. Cosmopolitan in the tropics, occurring also at the Cape and in Australia.

16. DOLICHOS, Linn.; Fl. Brit. Ind. ii, 209.

Usually twining herbs with stipellate 3-foliolate leaves and subpersistent stipules, bracts and bracteoles. *Flowers* racemose or axillary. *Calyx-tube* campanulate; teeth long or short. *Corolla* much-exserted, its petals usually equal in length; *keel* blunt or beaked, not spirally twisted. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* nearly sessile, many-ovuled; *style* thickened upwards and bearded down the inner edge, or filiform and pennicillate round the terminal stigma. *Pod* flat, linear or oblong, recurved.—Species about 20, widely spread in the tropics of both Hemispheres.

Style thickened upwards and bearded along the inner edge	1. *D. Lablab.*
Style filiform, minutely pennicillate round the stigma	2. *D. biflorus.*

1. D. Lablab, *Linn. Sp. Pl. 725; F. B. I ii. 209; DC. L'Orig. Pl. Cult. 277; Field & Gard. Crops, Part II, 23, t. XXXIV A; Watt E. D.; Prain in Journ. As. Soc. Beng. LXVI, pt. ii, 54, 429.* Vern. *Sem, sembi.*

A tall nearly glabrous twining perennial or annual, with round smooth or slightly downy stems. *Leaves* 4-12 in. long; *stipules* ¼ in., basifixed, lanceolate; *petiole* 2-8 in., glabrous; *leaflets* 2-6 in. long, ovate, acute, entire, base cuneate or deltoid, pale green and glabrous or slightly pubescent beneath; *stipels* small, subulate, smooth; *petiolules* ¼ in., puberulous. *Racemes* 6-9 in. long, lax, on peduncles 5-8 in. long; *pedicels* fascicled on nodes ½-¾ in. apart; *bracts* caducous; *bracteoles* oblong. *Calyx* ¼ in.; teeth short, deltoid. *Corolla* white or pink, ¾ in. long. *Pod* 1½-2 in. long, tipped with the hooked persistent base of the style. *Seeds* 3-5.

Extensively cultivated within the area for the sake of its pods which ripen during the cold season. It is usually grown along the borders of tall crops, and the castor-oil plant often forms its support. It is also trained to form arbours over the doorways of village huts. Roxburgh describes several varieties, two of which are found wild in Bengal. He calls them the 'kindney beans' of the Asiatics. This plant is cultivated throughout India, and sometimes as a field-crop without supports. The tender green pods are usually pickled and eaten in curries, and the stems afford a valuable fodder for cattle. The numerous varieties mentioned by Roxburgh are grouped by him under two distinct species, *viz.*, *D. Lablab* and *D. lignosus*, both of which are united under the former name in the Fl. Brit. India. Dr. Prain, however, has clearly shown (see reference above) that they are quite distinct and are deserving at least of varietal rank. He also points out that, as in the case of *Phaseolus Mungo* and *P. radiatus*, Roxburgh has reversed the incidence of the Linnean names.

VAR. 1, typica, *Prain l.c. 55.* D. Lablab, *Linn., Sp. Pl. 725.* D. lignosus, *Roxb. Fl. Ind. iii, 307 (not of Linn.).* Lablab vulgaris, *Savi; W. & A. Prod. 250. Pods* linear, tapering towards the apex. *Seeds* with their long axis parallel to the sutures.

VAR. 2, lignosa, *Prain l.c.* D. lignosus, *Linn. Sp. Pl. 726.* D. Lablab, *Roxb. l.c. 307 (not of Linn.).* Lablab cultratus, *DC.; W. & A. Prod. 251. Pods* shorter, with a broad and rounded apex. *Seeds* with their long axis across the pod. A cold-weather form of this, called *popat*, is grown to a large extent as a field-crop in the Central Provinces, and it requires no support.

2. D. biflorus. *Linn. Sp. Pl. 727; Roxb. Fl. Ind. iii, 313; F. B. I., ii, 210; Field & Gard. Crops, Part III, 2, t. LXXXI; Watt E. D.* D. uniflorus, *Lamk; W. & A. Prod. 249; Royle Ill. 193.* Johnia congesta, *D. & G. Bomb. Fl. Suppl. 23.* Vern. *Kulthi, kulat.* (Horse-gram of Madras.)

Annual *Branches* suberect or twining, downy or glabrescent. *Stipules* oblong, basifixed. *Leaflets* 1-2 in., broadly lanceolate or oblong, entire, membranous, downy; *stipels* subulate. *Flowers* 1-3, in the axils of the leaves; *bracts* lanceolate, one at the base of each pedicel and two placed laterally at the base of each flower. *Calyx* ¼ in., downy; teeth lanceolate-setaceous, much exceeding the tube. *Corolla* yellow, ½-¾ in. long; *keel* narrow, obtuse, rather shorter than the standard. *Pods* about 2 in. long, scimitar-shaped, compressed, recurved, downy, tipped with the persistent style. *Seeds* 5-6, compressed, reniform, grey or reddish-brown.

Cultivated in Dehra Dun and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh, also in Bundelkhand. DISTRIB. Punjab and Outer Himalaya to Sikkim, up to 7,000 ft., Cent. and S. India and Burma. It is grown within the Upper Gangetic area as a rainy-season crop, and the seeds are eaten chiefly by the poorer classes of the people. The plant as grown on the Himalaya is more robust, the pods are larger and broader, and

the seeds are grey. The stems and leaves are much valued all over India as a good fodder for cattle. It must not be confused with *Cyamopsis psoralioides*, to which the name *kulthi* is sometimes applied.

17. CLITORIA, Linn ; Fl. Brit. Ind. ii, 208.

Scandent or suberect undershrubs, with showy flowers, 3-7-foliolate leaves, stipellate leaflets and persistent membranous small stipules and bracts and large bracteoles. *Calyx* membranous, tubular ; teeth deltoid or lanceolate. *Corolla* much exserted ; *standard* spoon-shaped, very large ; *wings* and incurved *keel* much shorter. *Stamens* 1-adelphous or 2-adelphous ; *anthers* uniform. *Ovary* stalked, many ovuled ; *style* incurved, flattened, bearded along the inner side. *Pod* linear, flattish or turgid.—Species about 30, inhabiting chiefly the tropics of the New World.

C. Ternatea, *Linn. Sp. Pl. 753 ; Roxb. Fl. Ind. iii, 321 ; F. B. I. ii, 208 ; Watt E. D.* Vern. *Aparagita.*

A climber with slender terete downy stems. *Leaves* 4 in. long ; *petiole* ½in. ; *stipules* small, lanceolate ; *leaflets* 1-2in. long, ovate or oblong, obtuse, subcoriaceous ; *stipels* minute, linear. *Flowers* solitary, axillary ; *bracteoles* large, obtuse. *Calyx* ½-¾ in. ; teeth lanceolate, nearly as long as the tube. *Corolla* 1½-2 in. long, bright blue with an orange centre, or white. *Pod* 2-4 in., flattish, sparingly hairy, 6-10-seeded.

Extensively cultivated within the area, and often found in hedges as an escape. DISTRIB. Throughout India, and in most tropical countries. A dye is obtained, from the flowers and seeds, and various parts of the plant are used medicinally The flowers are used in religious ceremonies.

18. SHUTERIA, W. & A. ; Fl. Brit. Ind. ii, 181.

Climbers, with 3-foliolate stipellate leaves, and persistent striated stipules bracts and bracteoles. *Flowers* in racemes, medium-sized. *Calyx-tube* gibbous ; teeth distinct, shorter than the tube. *Corolla* exserted ; *petals* nearly equal, *standard* without auricles, *wings* spurred. *Stamens* 2-adelphous, *anthers* uniform *Ovary* subsessile, many-ovuled ; *style* incurved, filiform, beardless, *stigma* capitate. *Pod* flat, linear, recurved.—Species 6, five in India and one in Africa.

S. densiflora. *Benth. in Pl. Jungh. 232 ; Prain in Journ. As. Soc. Beng. LXVI, 402. S vestita, var.* densiflora, *Bak. in F. B. I. ii, 182.*

Leaflets oblong, subcoriaceous, glabrous. *Flowers* in dense racemes, often several from the same node. *Calyx* and *pod* glabrous.

Dehra Dun (Royle), Siwalik range (Duthie) DISTRIB. Himalaya from Garhwal to Nepal, Pachmarhi. Dr Prain says that it may easily be distinguished from *S. vestita* by its glabrous pods, and by the more horizontal early-forking secondary nerves of its larger leaflets.

19. DUMASIA, DC.; Fl. Brit. Ind. ii, 182.

Climbing herbs. *Leaves* 3-foliolate; *stipules* persistent; *leaflets* stipellate, not gland-dotted. *Flowers* medium-sized, racemose, *bracts* persistent. *Calyx-tube* cylindrical, very gibbous, with an oblique subtruncate mouth. *Corolla* exserted; *petals* equal; *standard* spurred on both sides of the base of the limb, *wings* and *keel* adherent, with small blades and very long claws. *Stamens* 2-adelphous; *anthers* uniform. *Ovary* linear, substipitate, few-ovuled; *style* long, flattened above its curve, beardless; *stigma* capitate. *Pod* linear, falcate, torulose.—Species 3, inhabiting Trop. Asia and Africa.

D. villosa, *DC. Mem. Leg. 257, t. 44; F. B. I. ii, 183; Royle Ill. 191.* D. congesta, *Grah.; W. & A. Prod. 206.*

Stems slender, densely clothed with grey or ferruginous hairs. *Petioles* 1-2 in. long; *stipules* minute, setaceous; *leaflets* ovate, obtuse, membranous, green and with a few obscure hairs above, grey and densely pubescent beneath, the end one 2-3 in long. *Racemes* 2-6 in., lax or rarely close, subsessile: *bracts* and *bracteoles* minute, setaceous. *Calyx* ¼-⅓ in., with a few appressed hairs. *Corolla* twice as long as the calyx, yellow or purplish. *Pod* 1½ in. long, velvety, 3-4-seeded.

Dehra Dun, Siwalik range and in Bundelkhand. DISTRIB. Himalaya from Simla to Sikkim and the Khasi Hills, ascending to 6-7,000 feet, Parasnath, S. India and Ceylon; also in Java, Madagascar and Natal.

20. GLYCINE, Linn.; Fl. Brit. Ind. ii, 183.

Twining or suberect herbs. *Leaves* with 3-7 stipellate leaflets. *Flowers* in axillary racemes, with minute narrow caducous bracts. *Calyx-tube* campanulate. *Corolla* usually little exserted; *petals* about equal in length, *standard* not distinctly spurred. *Stamens* more or less completely 1-adelphous, *anthers* uniform. *Ovary* subsessile, many-ovuled; *style* short, incurved, beardless, *stigma* capitate. *Pod* linear or linear-oblong, straight or recurved, flat or rather turgid, few-seeded.—Species about 15, spread through the tropics of the old world, also in Australia.

G. Soja, *Benth. in Journ. Linn. Soc. viii, 26*;* *F. B. I. ii, 184 (not of Sieb. & Zucc.)* G. hispida, *Maxim.; Watt E. D.; Field & Gard. Crops iii, 3, t. 85; Prain in Journ. As. Soc. Beng. LXVI (1897), 403.* Soja hispida, *Mœnch.; W. & A. Prod 247.* Dolichos Soja, *Linn.; Roxb. Fl. Ind. iii, 314; DC. L'Orig. Pl. Cult 264.* Vern. *Bhat.* (Soy bean, Japan pea).

An annual, with stout suberect or climbing stems, densely clothed with fine rusty-coloured hairs. *Leaves* 3-foliolate, long-petioled; *leaflets* 2-4 in. long, ovate, usually acute. *Racemes* sessile, few-flowered *Calyx* ¼ in., densely hairy; teeth long, setaceous. *Corolla* reddish-purple, not much exserted. *Pods* 2-3 in the axils of the leaves, 1½-2 in. long, linear-oblong, recurved, densely pubescent, subtorulose, 3-4-seeded.

Sparingly cultivated within the area, and confined to a few of the Sub-Himalayan districts. It is grown more extensively on the lower slopes of the Himalaya up to 6,000 feet, from the Punjab eastwards; also in Bengal, on the Khasia, Manipur and Naga Hills, and in Burma, but nowhere in India has it been found truly wild. DeCandolle considered the plant to be a native of Cochin China, Japan and Java at the time when the ancient inhabitants of that region began to cultivate it, and to use it as food As grown within the area of this flora, and in other parts of India, it represents a very inferior form of soy bean It is a rainy-season crop, and is usually sown in very poor land. Under proper cultivation the chemical composition of the bean shows it to be the richest of all the pulses in albuminoids and oil. In China and Japan various preparations are made from it, including soy-sauce, which is largely exported from those countries. The plant affords very excellent fodder for all kinds of stock, if harvested before it is fully matured.

21. TERAMNUS, Sw.; Fl. Brit. Ind. ii, 184.

Twining herbs of slender habit. *Calyx-tube* campanulate; teeth distinct, subequal or the 2 upper not so long. *Corolla* little exserted, *petals* about equal in length, standard not spurred. *Stamens* 1-adelphous; alternate anthers small, abortive. *Ovary* sessile, many-ovuled; *style* short, curved, beardless, *stigma* capitate. *Pod* linear, hooked with the persistent style at the tip, flattish, septate between the seeds.—Species 6, found in the tropics of both hemispheres.

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* The Russian botanist, Maximowicz, having, in 1873, shown that *G. Soja* of Sieb. and Zucc. is not the cultivated soy, but the wild species, afterwards named *G. ussuriensis* by Regel and Maack, suggested the use of the name *G. hispida* for the cultivated plant, thus retaining the specific epithet of Mœnch and DeCandolle. Dr. Prain, however, remarks (in Journ. As. Soc. Beng. l. c.) that the soy is no doubt Roxburgh's *Dolichos Soja*, and is most probably *D. Soja*, of Linnæus, and therefore it would be better to retain the name *G. Soja* for our plant, citing Bentham as the authority, and letting the name *G. ussuriensis* stand for the wild species, which was previously named *G. Soja* by Siebold and Zuccarini.

T. labialis, *Spreng. Syst. iii, 235; F. B. I. ii, 184.* Glycine labialis, *Linn.; Roxb. Fl. Ind. iii, 318; W & A. Prod. 208; D. & G. Bomb. Fl. 68.*

A wide-spreading slender climber, with a few appressed hairs on the stems. *Leaves* 2½-4½ in. long, with minute lanceolate deciduous stipules; *stipels* minute, subulate; *petiole* 1-1½ in.; *leaflets* 3, membranous or subcoriaceous, 1-2½ in. long, ovate-oblong with a rounded base, subacute or obtuse, glabrescent above, sparsely appressed-hairy beneath; lateral slightly smaller than the terminal. *Racemes* axillary, elongated, lax; *pedicels* solitary below, fascicled upwards; *bracts* narrowly lanceolate, caducous; *bracteoles* minute, subulate. *Calyx-teeth* subequal, about as long as the tube. *Corolla* reddish. *Pod* 1½-2 in. long, linear, glabrous, recurved, 8-12-seeded.

Siwalik range, Bundelkhand. DISTRIB. Punjab Plain, Bengal and south to Ceylon; also in Burma and Penang. Cosmopolitan in the tropics.

VAR. mollis, *Bak. in F. B. I. l. c.* T. mollis, *Benth.* Glycine mollis, *W. & A. Prod. 209. Stems* and *pods* clothed with longer and more spreading hairs; *leaflets* subcoriaceous, densely pubescent beneath; *calyx-teeth* shorter than the tube.—Moradabad (T. Thomson). DISTRIB. Bengal, Burma, Java.

22. PUERARIA, DC.; Fl. Brit. Ind. ii, 197.

Twining shrubs or herbs with stipellate pinnately 3-foliolate leaves; *leaflets* sometimes palmately lobed. *Flowers* sometimes appearing before the leaves, large or small, densely fascicled, in long often compound racemes; *rachis* swollen at the nodes. *Calyx-teeth* long or short, the 2 upper connate. *Corolla* distinctly exserted; *standard* usually spurred at the base, equalling in length the obtuse wings and keel. *Stamens* 1-adelphous, *anthers* uniform. *Ovary* sessile or nearly so, many-ovuled; *style* filiform, much incurved, beardless, *stigma* capitate. *Pod* linear, flattish.—Species about 12, inhabiting Trop. Asia, Japan and New Guinea.

Flowers appearing after the leaves fall, pods constricted between the seeds	*1. P. tuberosa.*
Flowers appearing with the leaves, pods not constricted between the seeds.	
Branches glabrous	*2. P. Wallichii.*
Branches densely clothed with spreading brown hairs	*3. P. phaseoloides.*

1. P. tuberosa, *DC. in Ann. Sc. Nat. Sér. I. iv. (1825), 97; W. & A. Prod. 205; Royle Ill. 191; D. & G. Bomb. Fl. 67; Brand. For. Fl. 141; F. B. I. ii, 197; Watt E. D.* Hedysarum tuberosum, *Roxb.; Fl. Ind. iii, 363.* Vern. *Surál, sarrár, sarwála* (Bijnor), *ghora-bel* (Merwara).

A twining shrub with deciduous foliage, and very large tuberous roots. *Stems* woody, tuberoled, the young branches finely grey-downy. *Stipules*

minute, deciduous, cordate-ovate. *Leaflets* 6-12 in. each way, broadly ovate-acuminate, green and glabrescent above, densely clothed beneath with whitish appressed pubescence; the lateral ones oblique. *Flowers* in dense virgate leafless often panicled racemes; *pedicels* very short, densely fascicled; *bracts* minute. *Calyx* ¼-½ in. long, very silky; teeth subobtuse, shorter than the tube. *Corolla* bright blue, nearly twice the calyx; *standard* distinctly spurred at the base; *wings* obliquely oblong; *keel* obtuse. *Pod* 2-3 in. long, flat, constricted between the seeds, densely clothed with soft brown bristle-like hairs.

Dehra Dun, Siwalik range, N. Oudh, Bundelkhand, Merwára. DISTRIB From the W. Himalaya to Sikkim, up to 4,000 ft. in Kumaon; lower hills of Punjab, on Mt. Abu, and in the hilly tracts of Bengal and S. India. The plant is leafless between November and May, and the flowers appear during March and April. The large tuberous roots, called *bilaikand* are used medicinally, and sometimes as food.

2. P. Wallichii, *DC. in Ann. Sc. Nat. Sér. I, iv (1825). 97; F. B. I. ii, 198; Prain in Journ. As. Soc. Beng. LXVI (1897), 419.* Dolichos frutescens, *Ham. in Don Prod. 240.*

A shrub, with slender terete glabrous branches. *Stipules* basifixed. *Leaflets* membranous or subcoriaceous, green and glabrescent above, grey with a few appressed hairs beneath; the end one 4-6 in. long, obovate-cuspidate, with a deltoid base. *Racemes* copious, 3-6 in. long, often fascicled or panicled; *pedicels* about equalling the calyx, finely silky. *Calyx* gibbous, ⅛ in.; teeth obscure, deltoid. *Corolla* about ½ in. long, reddish; *standard* not spurred at the base. *Pod* straight, 4-5 in. long, rigidly coriaceous, glabrous.

Hardwar (Wallich). DISTRIB. Sub-Himalayan tract from Nepal to Sikkim, Khasia Hills, Sylhet, Upper Burma.

3. P. phaseoloides, *Benth. in Journ Linn. Soc. IX (1867), 125. F. B. I. ii, 199; Prain in Journ. As. Soc. Beng. LXVI (1897), 61.*

A slender creeper. *Stems* hardly woody, appressed pubescent. *Leaves* 6-8 in. long, contemporaneous with the flowers; *petiole* 3-4 in., densely clothed with spreading hairs; *stipules* small, lanceolate, basifixed; *leaflets* 3-6 in. long, membranous dull-green and sparsely hairy above velvety-tomentose beneath; base widely cuneate; apex subobtuse, with an entire repand or 3-lobed margin; *stipels* small, subulate. *Inflorescence* of long-peduncled axillary puberulous racemes of fascicled flowers; *bracts* and *bracteoles* lanceolate appressedly bristly. *Calyx* ¼ in., campanulate, clothed with appressed bristly hairs; lowest tooth lanceolate, as long as the tube, the others shorter, all with setaceous tips. *Corolla* more than twice the calyx, pale-blue and white; *standard* distinctly spurred at the base. *Pods* many, 3½ in. long, ultimately glabrescent. *Seeds* about 16, dark brown and minutely rugulose.

Dehra Dun and N. Oudh (Duthie). DISTRIB. Trop. Himalaya from Garhwál eastwards, Bengal, Burma, Andaman Islands, Malay Penins. and Islands and in China.

23. CANAVALIA, DC. Fl. Brit. Ind. ii, 195.

Large twining perennials or biennials with stipellate 3-foliolate leaves and showy flowers. *Calyx* tubular ; upper lip projecting, entire or emarginate, lower shortly 3-toothed. *Corolla* far-exserted ; *standard* large, roundish ; *wings* shorter, equalling the incurved obtuse keel. *Stamens* 1-adelphous, *anthers* uniform. *Ovary* obscurely stalked, many-ovuled ; *style* incurved, beardless, *stigma* terminal. *Pod* large, linear or oblong, flat or turgid, with a longitudinal rib along each margin of the flattened upper suture.—Species about 12, inhabiting the warmer parts of both hemispheres.

C. ensiformis, *DC. Prod. ii, 404 ; F. B. I. ii, 195 ; Watt E. D ; Field & Gard. Crops Part iii, 1, t. 81 ; Prain in Journ. As. Soc. Beng. LXVI, part 2, 62.* C. gladiata, *DC ; W. & A. Prod. 253.* Dolichos gladiatus, *Jacq. ; Roxb, Fl Ind. iii, 300.* Vern. *Sem, bara sem.* (Sword bean.)

A large biennial or perennial climber with glabrous stems and branches. *Leaves* 10-12 in. long ; *petiole* 6 in ; *stipules* minute, deciduous ; *leaflets* 5-6 in. long, ovate, acute, rounded at the base, the lateral pair obliquely so, membranous, very soon glabrous ; *stipels* subulate, caducous. *Peduncles* 4-6 in., axillary, bearing loose many-fld. racemes 3-4 in. long. *Flowers* solitary or in pairs from swollen nodes ; *bracteoles* minute, ovate, caducous. *Calyx* about ¼ in. long, sparsely hairy ; upper lip ⅓ the length of tube. *Corolla* 1½ in. long, lilac or white. *Pods* few, linear-oblong, slightly curved, varying in length from 6-24 in. ; dorsal suture strongly 3-keeled. *Seeds* 1¼ by ¾ in., white, grey or more usually red.

Cultivated to a large extent within the area, either on the borders of fields, or very frequently it is allowed to climb over the roofs of native huts. DISTRIB. Throughout India, and everywhere in the tropics. The seeds and pods are much eaten by the natives of India ; and the pods, when young, are sliced and cooked as a make-shift for French beans. A form of this plant, found wild in Bundelkhand and other parts of India, is probably, as Mr. Baker suggests (F. B. I. l.c.), the *C. virosa* of W. & A. (*D. virosus, Roxb.*). It differs from the type in having smaller and more obtuse leaflets, also smaller flowers and pods, and the seeds are said to be bitter.

24. MUCUNA, Adans. ; Fl. Brit. Ind. ii, 185.

Perennials and annuals of wide-twining habit. *Leaves* ample, 3-foliolate and stipellate. Rachis of inflorescence swollen at the nodes. *Flowers* large, showy, usually dark purple, turning black when dried. *Calyx-tube* campanulate ; two upper teeth quite connate, lowest longer than the middle ones. *Corolla* much exserted, *keel* exceeding the wings and standard. *Stamens* 2-adelphous, *anthers*

dimorphous. *Ovary* sessile, many-ovuled; *style* incurved, beardless, *stigma* capitate. *Pod* very variable in shape and sculpture, usually covered with brittle needle-like irritating bristles.—Species about 30, throughout the tropics.

Woody climbers, with the faces of pod obliquely plaited.

Sutures of pod winged . . .	*1. M. imbricata.*
Sutures of pod not winged . . .	*2. M. atropurpurea.*
Annuals, with the valves of pod not obliquely plaited.	
Flowers in racemes, pods densely bristly	*3. M. pruriens.*
Flowers in corymbs; pods much longer, clothed with short deciduous bristles . .	*4. M. capitata.*

1. M. imbricata. *DC. Prod. ii, 406; F. B. I. ii, 185; Prain in Journ. As. Soc. Beng. LXVI, part ii, 65.* M. monosperma, *Wall. (in part)! Royle Ill. 191.*

A large woody climber with slender glabrescent branches. *Leaves* 9-15 in. long; stipules linear, ¼ in. long; *leaflets* 5-7 in. long, membranous, glabrous or with a few appressed hairs beneath, ovate-oblong, cuspidate, rounded at the base, the lateral ones obliquely so; *stipels* subulate. *Racemes* axillary, laxly 8-10-flowered; *pedicels* in the axils of large deciduous boat-shaped bracts, 1-3-flowered; *bracteoles* small, caducous. *Calyx* ¾ in., sparsely bristly outside; tube campanulate, hardly longer than the wide triangular teeth. *Corolla* 2-2¼ in. long, dull purple; *standard* half as long as the abruptly inflexed keel; *wings* ½ in. wide. *Pod* oblong, 4½-6 in. long by 2¼ in. wide, clothed with deciduous bristles; the wings ½ in. wide; plaits hardly crossing the wings. *Seeds* 2-3.

Dehra Dun and Siwalik range. DISTRIB.: Himalaya from Kumaon eastwards, up to 4,000 ft.; Manipur, Burma and Andaman Islands. Flowers during the rains.

2. M. atropurpurea. *DC. Prod. ii, 406; W. & A. Prod. 254; F. B I. ii, 186.* Carpopogon atropurpureum, *Roxb. Fl. Ind. iii, 297.* Vern. *Bhainswali-bel* (Dehra Dun).

A woody climber with slender glabrous branches. *Leaflets* 5-8 in. long, ovate or oblong, glabrous, shining above, lateral very oblique, the end one cuspidate. *Racemes* 6-12 in., on long peduncles, drooping, sometimes forked; *bracts* small, ovate, caducous; *bracteoles* oblong-spathulate. *Calyx* about ¼ in long, its upper lip more than half as long as the tube, sparsely clothed with rusty-coloured irritating bristles. *Corolla* 2-2½ in., dark-purple; *standard* 1 in. broad and about half the length of the abruptly inflexed keel; *wings* about half the length of

the standard. *Pod* 3-4 in. long and about half as broad, the faces traversed with close oblique plaits, and densely clothed with yellow-brown irritating bristles. *Seeds* 2.

Dehra Dun. DISTRIB.: Outer Himalaya from Jaunsár to Kumaon, also in S. India and in Ceylon. Flowers during the rains, and the fruit ripens in the cold season.

3. M. pruriens, *DC. Prod. ii, 405; Royle Ill. 191; F. B. I. ii, 187; Watt E. D.* Carpopogon pruriens, *Roxb. Fl. Ind iii, 283.* M. prurita, *Hook.; W. & A. Prod. 255; D. & G. Bomb. Fl. 70.* Vern. *Káunch, gáunch* (Cowitch or Cowhage).

A slender climbing annual. *Branches* appressed-pubescent, at length glabrescent. *Leaves* 6-9 in. long; *leaflets* 3-5 in. long, ovate-rhomboid, membranous, green and glabrescent above, lustrous with grey silky pubescence beneath; *petioles* 2½-4½ in. *Racemes* drooping, on short peduncles, 1-12 in. long, 3-30-flowered, rachis finely silky; *bracts* ¼ in.; *bracteoles* smaller, lanceolate. *Calyx* ⅜ in. long, with a few pungent bristles, tube hardly as long as the lower lanceolate tooth. *Corolla* 1¼-1½ in. long, purplish; *wings* rather shorter than the slightly incurved keel. *Pod* 2-3 in. long, 5-6-seeded, turgid, ridged longitudinally, recurved in the lower half, abruptly hooked at the tip, clothed with dense very pungent subpersistent pale-brown or grey bristles.

Dehra Dun, Siwalik range and Sub-Himalayan tracts, also in Bundelkhand and Merwára. DISTRIB.: Punjab Plain, from the base of the Himalaya to Ceylon and Burma. Cosmopolitan in the tropics, and often cultivated. Flowers during the rainy season. The root and seeds are medicinal, and the irritating hairs of the pods are used as a vermifuge.

4. M. capitata, *W. & A. Prod. 255; F. B. I. ii, 187; Prain in Journ. As. Soc. Beng. LXVI (1897), 409.* Carpopogon capitatum, *Roxb. Fl. Ind. iii, 284.*

Annual. Stems and under surface of the leaflets glabrescent. *Flowers* few, in corymbs. *Calyx* and *corolla* as in preceding. *Pod* 5-6 in. long, clothed with short deciduous bristles.

Siwalik range (Kánjilál). DISTRIB.: Foot of the W. and E. Himalaya, C. India and Chota Nagpur; also in Java. Flowers during the rainy season.

25. ERYTHRINA, Linn., Fl. Brit. Ind. ii, 188.

Trees with prickly branches. *Flowers* large, coral red, in dense racemes, produced usually before the development of the large pinnately 3-foliolate stipellate leaves. *Calyx* oblique, spathaceous, finally slitting down to the base, or campanulate-bilabiate. *Petals* very unequal; *standard* always much exserted and very much exceeding the keel and wings. Upper *stamen* free down nearly to

the base, or connate with the others half-way up the filaments; *anthers* uniform. *Ovary* stalked, many-ovuled; *style* incurved, beardless, *stigma* capitate. *Pod* linear, fertile turgid and torulose throughout, or flat and seedless below.—Species 25-30, in the tropics of both hemispheres and at the Cape.

The Indian Coral-tree (*E indica, Lamk.*) is often planted in garden, and during the month of March it is very conspicuous by its brilliant scarlet flowers, which open before the leaves appear. As a wild species it is mostly confined to localities near the sea-coast.

Herbaceous, flowers appearing before the leaves	1. *E. resupinata.*
A tree, with the flowers and leaves contemporaneous	2. *E. suberosa.*

1. E. resupinata, *Roxb. Cor. Pl t. 220; Fl. Ind. iii, 257; Brand. For. Fl. 141; F. B. I. ii, 189.*

Leaves borne on herbaceous stems produced from a perennial rootstock; *petioles* long; *stipules* ovate; *leaflets* 2-3 in. long and broad, round-cordate, entire, glabrous, nerves beneath sometimes prickly. *Racemes* direct from the rootstock, dense and many-fld, appearing before the leaves; *peduncles* short, *prickly*. *Flowers* in threes, large. *Calyx* ½-¾ in., 2-lipped, campanulate. *Standard* oblong, bright-scarlet, 3-4 times the calyx, resupinate; *keel* half as long as the standard, tinged with red: *wings* much shorter, greenish. *Pods* stipitate, erect, about 3 in. long by ⅓ to ½ in broad, flat, falcate, torulose, 3-seeded.

Abundant on grass lands (chandars) in the districts of N. Oudh and Gorakhpur. DISTRIB.: Parasnáth. A remarkable species, always retaining its dwarfed condition by reason of periodical jungle-fires. The flowers are produced in March, and present a very beautiful appearance. The short herbaceous leaf-bearing stems die down after the rains are over.

2. E. suberosa, *Roxb. Hort. Beng 53; Fl. Ind. iii, 253; W. & A. Prod. 260; D. & G. Bomb. Fl. 70; Brand. For. Fl. 140; F. B. I. ii, 190; Watt E. D.* E. sublobata, *Roxb l.c. 254 (sp.); W. & A Prod. 261.* Vern. *Dauldhák, madár, nasut, pangra*

A medium-sized deciduous tree with deeply cracked corky bark. *Branches* armed with white or pale-yellow prickles. Young parts, under surface of leaflets and inflorescence softly tomentose. *Leaflets* 3-8 in. broad, often broader than deep, green and glabrous above, glaucous and matted with grey cottony pubescence beneath, rhomboid, entire or lobed, acute, base broadly deltoid. *Racemes* dense, terminating the branches. *Calyx* campanulate, becoming deeply 2-labiate. *Standard* 1½-2 in. long, oblong, narrowed into a short claw; *keel-petals* connate, less than ½ the length of the standard. Upper *stamen* free from low down. *Pod* 5-6 in. long, terete, tapering at the ends, torulose, *seeds* 4-5 black.

Siwálik range, Rohilkhand, N. Oudh, Agra dist. Bundelkhand and Merwára. DISTRIB.: Punjab Plain, Rájputána, Central and S. India. The old leaves fall during the cold season, and the young foliage appears in March, shortly before the flowers open. The wood is very soft, but tough, and is used chiefly for making scabbards and sieve-frame, and occasionally for planking.

VAR. glabrescens, *Prain in Journ. As. Soc. Beng., LXVI, pt. 2 (1897), 410.* *Leaflets* as in typo, but glabrescent beneath at an early stage.—Dehra Dún and Saharanpur forests. DISTRIB.: Hot valleys of W. Himalaya from Bashahr eastward to Sikkim; also in Burma and on the Shan Hills.

26. **GALACTIA,** P. Br.; Fl. Brit. Ind. ii, 192.

Twining herbs with 3-foliolate stipellate leaves; like *Glycine* in habit, but with the nodes of the raceme slightly tumid. *Calyx-tube* short; teeth linear or lanceolate, the 2 uppermost entirely fused in one. *Corolla* little exserted, its petals nearly equal in length; *keel* obtuse, nearly straight. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* subsessile, many-ovuled; *style* long, filiform, beardless, *stigma* capitate. *Pod* linear, flattened, recurved.—Species about 50, chiefly Trop. American.

G. villosa, *W. & A. Prod. 207; Prain in Journ. As. Soc. Beng. LXVI, pt. 2, 411.* *G. tenuiflora* var. villosa, *F. B. I. ii, 192.*

Stems, leaves beneath and pods densely grey-downy. *Leaflets* 1-1½ in. long, oval or oblong. *Flowers* fewer and smaller than in *G. tenuiflora*. *Calyx* campanulate, softly hairy.

Bundelkhand (Edgeworth), Guna (King). DISTRIB.: W. Behar (Kurz) to S. India and Burma. Wight and Arnott (l.c.) remark that when the leaves are old they become more glabrous, especially those near the root, but in *G. tenuiflora* they are not villous at any period.

27. **BUTEA.** Roxb.; Fl. Brit. Ind. ii, 194.

Erect trees or climbing shrubs, with 3-foliolate large stipellate leaves. *Flowers* densely fascicled, large, showy, in axillary racemes, or in terminal racemes or panicles. *Calyx* broadly campanulate; teeth short, deltoid. *Corolla* much exserted; *petals* nearly equal in length, *keel* much curved, subobtuse or acute. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* sessile or stalked, 2-ovuled; *style* filiform, curved, beardless, *stigma* capitate. *Pod* firm, ligulate, splitting round the single apical seed, indehiscent below.—Species 3, all Indian.

A tree	1. *B. frondosa*.
A large climbing shrub	2. *B. superba*.

1. B. frondosa. *Roxb. Cor. Pl. i, 21, t. 21; Fl. Ind. iii, 244; W. & A. Prod. 261; D. & G. Bomb. Fl. 71; Brand. For. Fl. 142; F.B.I. ii, 194; Watt E.D.*-Vern. *Dhák, palás, chalcha* (Bundelkhand).

A small or moderate sized tree with a crooked trunk and irregular branches, young parts silky-pubescent. *Petioles* 3-6 in.; *stipules* and *stipels* small, deciduous; *leaflets* 4-8 in. long, rigidly coriaceous, glabrescent above, silky-tomentose and strongly veined beneath; terminal one rhomboid from a cuneate base, obtuse or emarginate; lateral obliquely ovate. Branches of inflorescence brown-velvety. *Flowers* 2-3 in. long, in fascicles from the swollen nodes of stout rigid axillary and terminal racemes. *Calyx* ½ in. long, brown-velvety outside, grey-silky within. *Petals* bright orange-red, silvery tomentose outside, nearly equal; *standard* 1 in. broad; *keel* much curved, acute, 4 times as long as the calyx. *Pod* 4-8 by 1½-2 in., grey-downy, narrowed suddenly into a stalk longer than the calyx. *Seed 1*, within the dehiscent apex of the pod.

Abundant within the area. DISTRIB.: W. Himalaya up to 4,000 feet, Punjab Plain and Bengal to Ceylon and Burma, frequently gregarious. In Upper India it is usually found in open country and not in thick forests; and very often, owing to constant lopping, it remains permanently as a shrub. It thrives on a saline soil, and attempts have been made to extend its growth on the usar tracts of the Doab. The tree is in flower during March and April, and at that time presents a strikingly beautiful object in the landscape. Many useful products are obtained from it. A good fibre is prepared from the root-bark. A ruby-coloured gum, called *Bengal kino*, is obtained from incisions made in the bark. A beautiful yellow dye is prepared from the flowers, and is used chiefly for sprinkling during the Holi festival. Lac is often collected from the branches. The leaves serve the purpose of plates, and for wrapping up parcels, and the foliage is given as fodder to buffalos and elephants. In Dr. Watt's Dictionary full information will be found regarding these and other useful products, and also as to the sacred character of this tree.

2. B. superba. *Roxb. Cor. Pl. 23, t. 22; Fl. Ind. iii, 247; W. & A. Prod. 261; Royle Ill. 195; D. & G. Bomb. Fl. 71; Brand. For. Fl. 143; F. B. I. ii, 195; Watt E. D.*

A large woody climber, differing from *B. robusta* mainly by its scandent habit. *Leaflets* and *flowers* larger, the former sometimes reaching 20 in. long. *Racemes* about 1 foot long; *pedicels* sometimes three times as long as the calyx.

Forests of N. Oudh and Bundelkhand. DISTRIB.: Chota Nagpur, C. and S. India and in Burma. The orange-red flowers, which make their appearance in March and April, are even more gorgeous than those of the preceding. A similar kind of *kino* is obtained from it, and the leaves afford valuable fodder.

28. SPATHOLOBUS, Hassk., Fl. Brit. Ind. ii, 193.

Woody climbers with 3-foliolate stipellate leaves. *Flowers* small or medium-sized, in ample terminal panicles, extending into the axils of the upper leaves, the *pedicels* densely fascicled at the tumid nodes. *Calyx* campanulate; teeth lanceolate or oblong-deltoid, the upper 2 connate. *Corolla* distinctly exserted, its petals sub-equal, *keel* obtuse and nearly straight. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* sessile or stalked, 2-ovuled; *style* incurved, beardless, *stigma* capitate. *Pod* thick, flat, indehiscent and seedless below, 1-seeded and tardily dehiscent at the tip.—Species about 10, one in W. Africa, the rest in Trop. Asia.

S. Roxburgii, *Benth. in Miq. Pl. Jungh. 238; Brand. For. Fl. 143; F. B. I. ii, 193; Watt E. D.; Prain in Journ. As. Soc. Beng. LXVI (1897), 412. Butea parviflora, Roxb. Fl. Ind. iii, 248; W. & A. Prod. 261; D. & G. Bomb. Fl. 71.* Vern. *Mula, maula, malha-bel* (Dehra Dun).

A robust climber. Young parts, inflorescence and underside of leaflets grey-velvety. *Leaflets* 6-8 in. long, obovate or elliptic, obtuse emarginate or abruptly acuminate, subcoriaceous, glabrescent above. *Flowers* less than ½ in. long, very shortly pedicelled, fascicled on the tumid nodes of large terminal panicles. *Calyx* densely pubescent. *Corolla* about twice the calyx, whitish. *Pod* 3-4 in. long and about 1 in. broad, clothed with soft brown tomentum, stalk about ½ in. long.

Common in Dehra Dun and on the Siwalik range, as well as in the forests of Rohilkhand and N. Oudh. DISTRIB.: From the foot of the Himalaya to S. India, also in Burma. Flowers during the cold season. As a climber it does great damage to trees The stems exude a red astringent gum, resembling *kino*.

29. PSORALEA, Linn.; Fl. Brit. Ind. ii, 103.

Herbs or undershrubs. *Leaves* simple or odd-pinnate, conspicuously gland-dotted. *Calyx-tube* campanulate, teeth distinct *Corolla* little exserted; petals all with distinct claws; *keel* obtuse, the tip slightly incurved. Upper *stamen* free or connate, the tube in an early stage often closed; *anthers* small, uniform or slightly dimorphous, obtuse. *Ovary* sessile or shortly stalked, 1-ovuled; *style* long, filiform, incurved; *stigma* minute, terminal. *Pod* ovoid or oblong, 1-seeded, indehiscent, the pericarp adhering to the seed.—Species about 100, mostly S. African and N. American.

P. corylifolia, *Linn. Sp. Pl. 764; Roxb. Fl. Ind. iii, 357; W. & A. Prod. 198; Royle Ill. 191; D. & G. Bomb. Fl. 60; F. B. I. ii, 103; Watt E. D.* Vern. *Babchi.*

An erect annual, 1-3 ft high. *Branches* firm, gland-dotted. *Leaves* simple, 1-3 in. long, roundish, repand-toothed, firm, glabrescent, both.

sides with conspicuous black glandular dots. *Flowers* 10-30, in dense long-peduncled heads *Calyx* ⅛ in.: teeth lanceolate, the lowest longest, *Corolla* little exserted, white or yellow with purple-tipped keel. *Pod* small, subglobose, black, glabrous

Dehra-Dun, Oudh, Bundelkhand. DISTRIB.: Throughout India to Ceylon, also in Burma The seeds are used as a remedy for leprosy.

30. SESBANIA, Pers. ; Fl. Brit. ii, 114.

Soft-wooded shrubs or herbs, with long very narrow abruptly pinnate leaves. *Leaflets* very numerous, deciduous, linear-oblong, obtuse, mucronate. *Flowers* in axillary racemes. *Calyx* campanulate, shallowly 2-lipped or 5-toothed. *Corolla* much exserted ; petals all with long claws ; *standard* broad ; *keel* straight and obtuse, or (in Subgenus. *Agati*) recurved and subrostrate. *Stamens* 2-adelphous ; *anthers* uniform, obtuse. *Ovary* stalked, linear, many-ovuled ; *style* filiform, incurved, glabrous, *stigma* capitate. *Pod* very long, narrow, dehiscent, septate between the numerous seeds.—Species about 20, spread throughout the tropics.

Flowers small, yellow or spotted with purple.	
Perennial, unarmed	*1. S. ægyptiaca.*
Annual, prickly	*2. S. aculeata.*
Flowers large, white or pink. A soft-wooded tree	*3. S. grandiflora.*

1. S. ægyptiaca, *Pers. Syn. ii, 316 ; W. & A. Prod. 214 ; Royle Ill. 191 ; Brand. For. Fl. 137 ; F. B. I. ii, 114 ; Wall E. D ; Prain in Journ. As. Soc. Beng. LXVI, pt 2 (1897), 367.* Æschynomene Sesban, *Linn.; Roxb. Fl. Ind. iii, 332.* Vern. *Jait.*

A glabrous unarmed soft-wooded shrub or small tree of short duration, 10-15 ft. high, with slender terete branches. *Leaves* 3-6 in. long ; *leaflets* many, ¾-1 in. long, linear-oblong, membranous, pale-green, very shortly stalked. *Flowers* 6-10, in lax axillary racemes. *Calyx* ¼ in., with short deltoid teeth. *Corolla* ½-¾ in. long, pale-yellow, often dotted or tinged with purple. *Pod* 6-9 in. long, torulose, flexible and twisted.

Planted or naturalized within the area. DISTRIB.: Throughout India, ascending to 4000 feet on the W. Himalaya, but not indigenous. It is widely cultivated in the tropics of the Old World, and is believed to be wild in tropical Africa. This plant is remarkable for its quick growth, and for this reason it is often grown in hedges. It flowers during the early part of the cold season. Very excellent gunpowder charcoal is made from its soft white wood. Its fibre is made into ropes, and the foliage is valued as cattle-fodder.

By the colour of the flowers three distinct forms may be recognized :—1. typica, *Prain l.c.*, in which the corolla is uniformly yellow ; 2. picta,

Prain l.c., in which the standard is externally dotted with purple; S. bicolor, *W. & A. l.c.*, in which the standard is dark maroon or purple outside. This last is the one most commonly met with in Upper India.

2. S. aculeata, *Pers. Syn. ii, 316; Royle Ill. 191; F. B. I. ii, 115 (excl. all vars.); Watt E. D. (in part); Prain in Journ. As. Soc. Beng. LXVI, pt. 2 (1897), 369.* Vern. *Jayanti.*

A large erect shrub-like glabrous annual. *Branches* and underside of leaf-rachis armed with small hooked prickles. *Leaves* 6-12 in. long; *leaflets* smaller and much more numerous than in *S. ægyptiaca*. *Flowers* rather smaller and yellow. *Pods* 6-9 in. long, narrowly linear and slightly falcate, beaked, not twisted, slightly torulose, glabrous.

Abundant within the area as a weed of rice-fields and swampy places. DISTRIB.: Plains from the W. Himalaya to Ceylon and Siam and cosmopolitan throughout the E. tropics. Dr. Prain recognizes the two following varieties:—

VAR. 1. typica, *Prain l.c.* Æschynomene spinulosa, *Roxb. Fl. Ind. iii, 333.* S. aculeata, *W. & A. Prod. 215 (excl. syn. Æ. cannabina, Roxb. & Æ. bispinosa, Jacq.).* *Stems* reddish, rather densely sprinkled with minute prickles.

VAR. 2. elatior, *Prain l.c.* S. cannabina, *W. & A. l.c.* (*not Æ. cannabina, Roxb.*)—*Stems* green, sparingly prickly, taller, lax and slender. S. cannabina, *Pers.*, which has been referred by many authors to this species is, according to Dr. Prain, quite distinct. It is *Æschynomene cannabina of Retzius*, and what Roxburgh (Fl. Ind. iii, 335) describes as the *Dhunchi* plant of Bengal. It is cultivated in Bengal and Burma for its fibre, which is used chiefly for making into fishing nets and lines.

3. S. grandiflora, *Pers Syn. ii, 316; Brand. For. Fl. 137; F. B. I. ii, 115; Watt E. D* Æschynomene grandiflora, *Linn.; Roxb. Fl. Ind. iii, 331.* Agati grandiflora, *Desv.; W. & A. Prod. 215; Royle Ill. 191.* Vern. *Basna.*

A short-lived soft-wooded tree, 20-30 ft. high. *Leaves* 6-12 in. long; *leaflets* of 16-30 pairs. *Racemes* short, pedunculed, 2-4 fld. *Calyx* shallowly 2-lipped. *Corolla* 3-3¼ in. long, white or pink. *Pod* up to 20 in. long, falcate or straight, firm; sutures thick; valves slightly constricted between the seeds.

This plant is grown within the area chiefly for the sake of its ornamental appearance. It is cultivated in other parts of India as a support for the Betel vine. It extends through Malaya to N. Australia. The young leaves, pods and flowers are eaten as a vegetable, and various parts of the plant are used medicinally.

31. Tephrosia, Pers.; Fl. Brit. Ind. ii, 110.

Herbs or undershrubs with odd-pinnate or rarely simple leaves; *leaflets* opposite, triple-veined, subcoriaceous. *Flowers* in terminal and leaf-opposed racemes, or solitary or in pairs in the leaf-axils. *Calyx* campanulate, with distinct subequal teeth. *Petals* clawed, *standard* suborbicular; *keel* incurved, not beaked. *Stamens* 2-adelphous; *anthers* uniform, obtuse. *Ovary* sessile, linear, many-ovuled; *style* much incurved, flattened or filiform, glabrous or bearded; *stigma* capitate, often penicillate. *Pod* linear, flattened, many-seeded, continuous or obscurely septate between the seeds.—Species about 120, spread over the tropics of both hemispheres.

Leaves simple . . . . . 1. *T. tenuis*.

Leaves odd-pinnate.

Calyx-teeth short, deltoid. A shrub . . 2. *T. candida*.

Calyx-teeth narrow, cuspidate. Perennial herbs.

Pod glabrescent or finely downy.

A suberect, nearly glabrous herb . 3. *T. purpurea*.

A diffuse downy herb . . . 4. *T. pumila*.

Pod densely white-velvety . . . 5. *T. villosa*.

1. T. tenuis, *Wall. Cat. 5070; D. & G. Bomb. Fl. 61; F. B. I. ii 111; Watt E. D.*

An annual with filiform densely cæspitose stems, 6-12 in. long, with a few short appressed hairs. *Leaves* simple, nearly sessile, 1-2 in. long, linear, narrowed suddenly or gradually at the apex, glabrous above, obscurely silky beneath; *stipules* minute, setaceous, ascending. *Flowers* 1-2 together in the axils of the leaves; *pedicels* filiform. *Calyx-teeth* lanceolate, much shorter than the tube, *Petals* with very long claws. *Style* short, glabrous, filiform. *Pod* linear, ½-1 in. long, thinly clothed with appressed hairs, 6-10-seeded.

Dehra Dun (Gamble), Agra district (Duthie). DISTRIB.: Plains of the Punjab and Sind, Konkan; also in Burma and in the Laccadive Islands.

2. T. candida, *DC. Prod. ii, 249; W. & A. Prod. 210; Royle Ill. 191; Brand. For. Fl. 138; F. B. I. ii, 111.* Robinia candida, *Roxb. Fl. Ind. iii, 327.*

A low shrub. *Branches* grooved, clothed with brown or grey persistent velvety pubescence. *Leaves* odd-pinnate, 6-9 in. long, shortly stalked; *stipules* setaceous; *leaflets* 19-25, narrowly elliptic, cuspidate at the apex, 2-3 in. long, dark-green and glabrous above, pale and silky beneath; *stalks* short, densely silky. *Racemes* 6-9 in. long, terminal and lateral, the

lower flowers often fascicled,; *pedicels* about ¼ in. long. *Calyx* ⅛-¼ in., densely silky, teeth shorter than the tube. *Corolla* ¾-1 in., white or tinged with red, *standard* densely silky outside. *Style* flattened, silky. *Pod* 3-4 in., slightly recurved, clothed with brown silky hairs

Dehra Dun. DISTRIB.: Trop. Himalaya from Garhwál to Khasia and Assam, up to 5,000 ft. in Sikkim, Bengal, Sylhet, Chittagong, Martaban, Malay Penins. and Islands. Flowers during the rainy season. The leaves and bark are used for poisoning fish.

3. T. purpurea, *Pers. Syn. ii, 329; W. & A. Prod 213; Royle Ill. 191; D. & G. Bomb. Fl. 61; F. B. I. ii, 112; Watt E. D.* Galega purpurea, *Linn.; Roxb. Fl. Ind. iii, 396.* G. lanceæfolia, *Roxb. l.c.* G. tinctoria, *Lamk.; Roxb. l.c (not of Linn.).*—Vern. *Sarphánki.*

A copiously branched suberect herbaceous perennial, with slender firm terete glabrescent branches. *Leaves* 3-6 in. long, short-petioled; *stipules* subreflexed; *leaflets* 13-21, narrowly oblanceolate about ½ in. long, green and glabrescent above, glaucous and obscurely silky beneath. *Racemes* 3-6 in. long, all leaf-opposed, lax, lower flowers fascicled; *pedicels* short, *bracteoles* minute *Calyx* as long as the pedicels, densely silky; teeth linear, as long as the tube *Corolla* ¼-⅜ in., red, thinly silky. *Style* glabrescent. *stigma* penicillate *Pod* 1½-2 in. long, glabrescent, slightly recurved, 6-8- seeded.

Common within the area, especially in sandy places. DISTRIB.: W. Himalaya up to 4,000 ft., and from Bengal to Ceylon; also in the Malay Penins. and in Siam. Flowers during the rainy and cold seasons. The plant is used medicinally.

4 T. pumila, *Pers. Syn. ii, 330; Prain in Journ. As. Soc. Beng. LXVI, pt. 2, 366.* T. diffusa, *W. & A. Prod. 213; Royle Ill. 191.* Galega diffusa, *Roxb. Fl. Ind. iii, 397.* T. purpurea *var.* pumila *in F. B. I. ii, 113; Watt E. D.*

A small herbaceous perennial, persistently downy. *Branches* diffuse. *Stipules* linear-setaceous. *Leaflets* 9-11, smaller and more downy than those of the preceding, often cuneate towards the base and retuse at the apex. *Corolla* and *pods* also smaller, and the latter much more downy.

Common on rocky ground and in sandy waste land. DISTRIB. Punjab Plain, and throughout the hotter parts of India.

5, T. villosa, *Pers. Syn. ii, 329; W. & A. Prod. 212; F. B. I. ii, 113; Watt E. D.* Galega villosa, *Linn.; Roxb. Fl. Ind. iii, 395.* P. argentea *Pers.; W. & A. Prod. 212.*

A small diffuse shrub. *Stems* flexuose, hoary with appressed silky pubescence *Leaves* nearly sessile, 2-3in long; *stipules* linear; *leaflets* 13-19, greyish-green and glabrescent above, persistently silky beneath, narrow, oblanceolate, often emarginate. *Racemes* elongated; lower flowers in distant fascicles, lowest often in the axils of the leaves; *pedicels* very short; *bracts* setaceous, plumose. *Calyx* about ¼ in.,

densely silky ; teeth setaceous, lower much exceeding the tube. *Corolla* little exserted, pale red ; *standard* hairy outside. *Pod* 1-1½ in. long, deflexed, falcate, densely clothed with white silky hairs ; *style* flattened, glabrous, *stigma* densely penicillate.

Jumna and Chambal ravines in the Etáwah district, Bundelkhand. DISTRIB. Throughout India to Ceylon ; also in Trop. Africa and in the Mauritius.

32. MILLETTIA, W. & A., Fl. Brit. Ind. ii, 104.

Trees, shrubs or large woody climbers, with odd-pinnate, rarely 1-foliolate leaves ; *leaflets* opposite, usually large, reticulate-veined generally stipellate. *Flowers* showy, in axillary solitary or fascicled racemes, and in terminal panicles, the flowers single or in fascicles along the rachis. *Calyx* campanulate, teeth usually short. *Corolla* much exserted, *petals* long-clawed ; *standard* broad, spreading or reflexed ; *wings* oblong, falcate ; *keel* incurved, obtuse. *Stamens* 1-adelphous or 2-adelphous, *filaments* filiform ; *anthers* uniform, muticous. *Ovary* linear, sessile or nearly so, surrounded at the base by an annular disk-like sheath ; *ovules* many ; *style* filiform, incurved, glabrous, *stigma* capitate. *Pod* linear, lanceolate or oblong, usually compressed, thickly coriaceous or woody, late- or hardly dehiscent.—Species about 60, chiefly in Indo-China and Malaya.

M. auriculata, *Baker in F. B. I. ii, 108 ; Brand. For. Fl. 138, Watt E. D.* Robinia macrophylla, *Roxb. Fl. Ind. iii, 329.* Vern. *Ganj, gonj.*

A large robust woody climber with finely downy branchlets. *Leaves* 1-2 ft. long ; *petiole* 4-6 in., swollen at the base ; *leaflets* 7-9, opposite, 3-8 in long, obovate, obtuse or cuspidate, membranous or subcoriaceous, densely grey-silky when young, at length glabrescent above ; *stipels* minute. *Flowers* in dense axillary racemes near the ends of the branches, fascicled on a downy rachis ; *bracts* minute, linear. *Calyx* ⅛ in., densely silky, teeth very short. *Corolla* whitish, three times the calyx, densely silky *Pod.* 5-7 in. long and about 1 in. broad, straight, woody, permanently clothed with reddish-brown tomentum ; sutures thickened.

Abundant in the forest tracts of Dehra-Dun, the Siwalik range, Rohilkhand, N. Oudh, Gorakhpur and Bundelkhand. DISTRIB. : Outer Himalaya from the Sutlej eastward to Sikkim, ascending to 3,500 feet, also on Parasnath in Bengal and south to the Godavery. Common in sál forests. Flowers April to June. It does considerable damage to forest trees unless kept under control. The branches yield a coarse fibre, and the leaves are used as fodder.

33. ASTRAGALUS, Linn.; Fl. Brit. Ind. ii, 118.

Herbs or undershrubs with pinnate leaves, the leaf-rachis often terminating in a spine. *Peduncles* axillary. *Calyx* tubular or campanulate, equal or gibbous on the back, teeth subequal. *Corolla* usually distinctly exserted; *petals* subequal, or wings and keel shorter than the standard; *keel* incurved, obtuse. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* sessile or stalked, many-ovuled, *style* incurved, *stigma* capitate. *Pod* linear or oblong, usually turgid, continuous within, or more or less completely longitudinally 2-celled from the introversion of the inferior suture.—Species upwards of 1,200, predominant in Central and W. Asia.

Flowers in dense peduncled heads .	. 1. A. *leucocephalus*.
Flowers in elongated racemes .	. 2. A. *graveolens*.

1. A. leucocephalus, *R. Grah. in Wall. Cat. 5923; Benth. in Royle Ill. 198, t. 32, fig. 2; F. B. I. ii, 128.*

A perennial with short densely cæspitose ascending stems clothed with loose white hairs. *Leaves* 1-3′ in. long; *stipules* small, leafy, connate below the middle; *leaflets* 21-31, oval-oblong, silvery-canescent. *Heads* small, dense, oblong, on long white-tomentose peduncles; *bracts* lanceolate, exceeding the buds. *Calyx* ⅓ in., shaggy with white hairs; teeth setaceous, as long as the tube. *Corolla* little exserted, pale-yellow; *keel* rather shorter than the standard and wings. *Pod* included in the calyx, sessile, oblong, unilocular, finely downy, 3-4-seeded.

Dehra Dun (Jacquemont). DISTRIB.: Punjab Plain, and on the W. Himalaya from Kashmir to Kumaon, up to 7,000 feet; also in Afghanistan

2. A. graveolens, *Buch.-Ham. in Wall. Cat. 5929; Benth. in Royle Ill. 199; F. B. I. ii, 131.* A. rotundifolius, *Royle l. c.*

A tall undershrub with copious virgate terete glaucous branches. *Leaves* 4-6 in. long; *stipules* 1-1¼ in. long, free, ovate or lanceolate, cordate; *leaflets* 17-19, roundish or oblong, firm, obtuse, glaucous, glabrous on both sides. *Racemes* on long peduncles: *bracts* linear, glabrous. *Calyx* ⅓ in. long, mouth very oblique, teeth ¼ as long as the tube. *Corolla* yellow, twice the calyx, *standard* slightly exceeding the wings and keel. *Pod* 1-1½ in. stalked, ensiform, subcompressed, 2-locular, membranous, glabrous, 12-18-seeded.

Dehra Dun, Oudh (Wallich). DISTRIB.: W. Himalaya from Kashmir to Kumaon, ascending to 12,000 feet; also in Afghanistan and Baluchistan.

34. CYAMOPSIS, DC; Fl. Brit. Ind. ii, 92.

Erect annuals, clothed with appressed hairs attached by their middle. *Leaves* 3-many-foliolate. *Flowers* in axillary racemes,

small, purplish. *Calyx-tube* oblique; teeth unequal, the lowest elongated and setaceous. *Petals* caducous, standard and wings narrow; *keel* obtuse, slightly incurved. *Stamens* 1-adelphous; *anthers* uniform, apiculate. *Ovary* sessile, linear, 6-8-ovuled; *style* short, filiform, much incurved; *stigma* capitate. *Pod* linear, straight, subtetragonous, septate between the seeds.—Species 2, one in India and the other Tropical African.

C. psoralioides, *DC. Prod. ii, 216; W. & A. Prod. 197; Royle Ill. 190; F.B.I. ii, 92; Field & Gard. Crops II, 24, t. XXXV; Watt E.D.* Dolichos fabæformis, *L'Herit.; Roxb. Fl. Ind. iii, 316.*—Vern. *Guár* (Meerut) *dararhi* (Farukhabad), *kuwára* (sub-montane tract), *khurti and khulthi,* (Muttra and Aligarh).

A robust annual, 2-4 ft. high, with erect 4-sided stems. *Leaves* 3-foliolate; *petioles* 1-2 in., channelled above; *stipules* linear-setaceous; *leaflets* 2-3 in. long, ovate, acute, coarsely toothed. *Flowers* in long axillary racemes, shortly stalked, pale-purple; *bracts* overtopping the flower-buds. *Calyx* $\frac{1}{8}$-$\frac{1}{5}$ in. *Corolla* slightly exserted. *Pod* 1½-2 in. long, erect, 3-keeled on back, 8-12-seeded.

Cultivated in many parts of the area, and in other parts of India from the Punjab southwards; but nowhere has it been found wild, except, perhaps in the Rawal Pindi district by Dr. Aitchison. Afghanistan is given as one of its habitats, and it may have been brought into India from that direction, but Boissier makes no mention of it in his' Flora Orientalis'. In the Doab of the upper Gangetic Plain *guár* is grown during the rainy season, and for two distinct purposes, *viz*, as a vegetable for human consumption, and as a pulse for feeding cattle. In the former case it is grown on specially manured land, and the part which is eaten is the young green pod. As a fodder crop its cultivation is mostly confiined to the districts of the Meerut Division.

35. INDIGOFERA, Linn.; Fl. Brit. Ind. II, 92.

Herbs or shrubs clothed more or less densely with appressed hairs attached by their middle, often silvery-canescent. *Flowers* usually in copious axillary racemes. *Calyx* minute, campanulate; teeth subequal, or the lowest longest. *Corolla* caducous, *standard* obovate; *keel* straight, not beaked, spurred on each side near the base. *Stamens* 2-adelphous, *anthers* uniform, apiculate. *Ovary* sessile, usually many-ovuled; *style* short, incurved; *stigma* capitate, usually penicillate. *Pod* usually linear-cylindrical, rather oblong or globose, turgid, rarely flattish or sickle-shaped or armed.—Species about 250, in all tropical regions, abundant also in S. Africa.

Leaves simple.
Pod globose, 1-seeded . . . . . *1. I. linifolia.*
Pod oblong, 1-2-seeded . . . . . *2. I. cordifolia.*

Leaves imparipinnate.
Flowers in axillary short-peduncled heads.
Leaves 3-foliolate . . . . . *3. I. glandulosa.*
Leaves 5-9-foliolate . . . . . *4. I. enneaphylla.*
Flowers in axillary racemes.
Pod quite flat . . . . . *5. I. anabaptista.*
Pod more or less turgid
Racemes laxly 2-4-flowered, leaflets 5 . *6. I. glabra.*
Racemes 6-12-flowered.
Leaflets 7-11. A gland-pubescent annual *7. I. viscosa.*
Leaflets 3.
End leaflet sessile. A perennial herb *8. I. trifoliata.*
End leaflet stalked. An undershrub . *9. I. trita.*
Racemes more than 12-flowered, bracts minute.
Leaves 5-foliolate.
Pod not torulose, 8-12-seeded . . *10. I. subulata.*
Pod distinctly torulose, 1-3-seeded . *11. I. angulosa.*
Leaves 3-foliolate, or the upper ones 5 fol.
Leaflets alternate, pod torulose. A silvery-canescent shrub . . *12. I. oblongifolia.*
Leaflets opposite, pod slightly torulose. A dwarfed undershrub . *13. I. Hamiltonii.*
Leaves 5-11-foliolate.
Pod 4-gonous, very hairy . . . *14. I. hirsuta.*
Pod cylindrical, glabrous when mature.
Pod 2-4-seeded, slightly torulose.
A silvery canescent shrub . . *15. I. articulata,*
Pod 8-12-seeded, not torulose . *16. I. tinctoria.*
Racemes more than 12-flowered, bracts exceeding the buds . . . *17. I. pulchella.*

1. I. linifolia, *Retz. Obs. iv, 29; Roxb. Fl. Ind. iii, 320; W. & A. Prod. 198; D. & G. Bomb. Fl. 59; F. B. I. ii, 92; Watt E. D.*—**Vern.** *Torki.*

A procumbent persistently silvery-pubescent perennial herb. *Stems* many, much branched. *Leaves* simple, ½-1 in. long, sessile or nearly so, usually linear, acute at both ends, mucronate, silvery above and beneath; *stipules* minute, setaceous. *Flowers* 6-12, in very small dense subsessile axillary racemes. *Calyx-teeth* setaceous, much longer than the tube. *Corolla* 2-3 times the calyx, bright red or white. *Pod* minute, globose, 1-seeded, apiculate, silvery-white. *Seeds* globose, shining.

Common throughout the area, especially amongst grass. DISTRIB. Throughout the hotter parts of India to Ceylon, and in Upper Burma; also in Afghanistan, Abyssinia, the Malay Islands and in N. Australia. The seeds of this plant are largely collected in famine times by the poorer people of W. India, and eaten in the form of bread.

2. I. cordifolia, *Heyne ex Roth Nov. Pl. Sp. 357; W. & A Prod. 199; Royle Ill. 191; D. & G. Bomb. Fl. 53; F. B. I. ii, 93; Watt E. D.*—Vern. *Vekriavas* (Rájputána).

A copiously branched diffuse annual, more or less clothed with long white hairs. *Stems* 3-9 in. long. *Leaves* simple, ½-¾ in. long, subsessile, ovate, cordate, obtuse, mucronate, densely hairy beneath; *stipules* minute, setaceous. *Flowers* 4-8, in dense nearly sessile heads. *Calyx* ⅛ in., with a short tube and long setaceous very hairy teeth. *Corolla* bright red, not exserted. *Pod* about ¼ in. long, oblong, terete, beaked, 2-seeded. *Seeds* ovate, truncated at one end, yellow.

Fairly common within the area, especially on sandy ground. DISTRIB. W. Himalaya up to 4,000 feet, plains of Punjab and Sind, Rájputána, C. W. and S. India; also in Afghanistan, Baluchistan, Nubia, Malay Islands and in N. Australia. The flour prepared from the seeds is largely used in Rájputána as a famine food.

3. I. glandulosa, *Willd. Sp. Pl. iii, 1227; Roxb. Fl. Ind. iii, 372; W. & A. Prod. 199; D. & G. Bomb. Fl. 53; F. B. I. ii, 94; Watt E. D.*

A perennial herb with long slender branches which are woody below, clothed when young with spreading hairs, not silvery-canescent. *Leaves* 3-foliolate, *petiole* nearly as long as the leaflets; *stipules* minute, setaceous; *leaflets* ½-1 in. long, stalked, membranous green above, glaucous and black-dotted beneath. *Flowers* in dense sessile or shortly pedunculed heads. *Calyx* ⅛ in. long; teeth long, setaceous. *Corolla* more than twice the calyx, reddish. *Pod* about ¼ in. long, oblong, finely pubescent, angled, the angles often slightly winged and toothed, 1-or 2-seeded.

Bundelkhand. DISTRIB. Behar, C. and W. India and in the Central Provinces. The seeds are used as a famine food in the same manner as are those of *I. linifolia* and *I. cordifolia* (see Agricultural Ledger No. 19, 1898).

4. I. enneaphylla, *Linn. Mant. ii, 272; Roxb. Fl. Ind. iii, 376; W. & A. Prod. 199; Royle Ill. 191; D. & G. Bomb. Fl. 53; F. B. I. ii, 94; Watt E. D.*

Annual or perennial, often with a woody rootstock. *Stems* densely cæspitose, 12-18 in. long, trailing and much branched, sparingly strigose with white appressed hairs. *Leaves* ½-1½ in. long, 5-9-foliolate, nearly sessile; *stipules* ovate, cuspidate, scariose; *leaflets* small, firm, oblanceolate, retuse, mucronate. *Flowers* small, nearly sessile, in dense oval short-peduncled spikelike heads; *bracts* lanceolate, acuminate, scariose. *Calyx* hairy; teeth long, setaceous. *Corolla* bright-red, slightly exserted. *Pod* ⅛ in., oblong, cylindrical, clothed with white appressed hairs. *Seeds* 2, with a partition between them.

Common in the area, especially amongst grass. DISTRIB Throughout India to Ceylon and Burma; also in Angola, the Malay Islands and N. Australia. This plant is greedily eaten by cattle, and Roxburgh states that it helps to form some of the best pasture-lands in Bengal.

5. I. anabaptista, *Steud. Nom. ed. II, i, 805; F. B. I. ii, 102.*

A diffuse annual with stems 1 foot or more long, thinly clothed with appressed white hairs. *Leaves* 1-1½ in., short-petioled; *stipules* setaceous, persistent; *leaflets* 3-7, opposite, ½-1 in. long, oblanceolate, appressed-hairy on both surfaces. *Racemes* short-peduncled, shorter than the leaves, densely 12-20-flowered. *Calyx* ⅛ in., silvery-canescent; teeth long, setaceous. *Corolla* scarcely exserted. *Pod* ½-¾ in. long, reflexed, linear, quite flat, clothed with appressed hairs, 6-8-seeded.

Found in the districts of Agra and Muttra. DISTRIB. Plains of Punjab and Sind; also in Afghanistan, Arabia and in the Nile basin.

6. I. glabra, *Linn. Sp. Pl. 751; Prain & E. Baker in Journ. Bot. XL (1902), 187.* I. pentaphylla, *Murr.; W. & A. Prod. 200; F. B. I. ii, 95.* I. fragrans, Retz.; *Roxb. Fl. Ind. iii, 375.*

A densely cæspitose annual. *Branches* many, slender, ascending, glabrous or with a few scattered glandless hairs. *Leaves* shortly petioled, ¾-1 in. long; *stipules* lanceolate, acute, hairy, persistent; *leaflets* 5, opposite, ¼-½ in. long, membranous, slightly appressed-hairy on both surfaces, glaucous beneath. *Racemes* short, axillary, laxly 2-4-flowered. *Calyx* 1½ in. long; teeth long, setaceous. *Corolla* ⅛ in., red. *Pod* about ¾ in., turgid, straight, glabrous, not torulose. *Seeds* 8-12, cylindrical, truncate at both ends.

Rohilkhand (T. Thomson). DISTRIB. Throughout India, from the Himalaya to Ceylon; also in Trop. Africa.

7. I. viscosa, *Lamk. Encycl. iii, 247; Roxb. Fl. Ind. iii, 377; W. & A. Prod. 200; F. B. I. ii, 95.*

An annual, up to 3 feet in height. *Branches* many, glandular-viscid, often somewhat woody below. *Leaves* ¾-1½ in. long; *petiole* ½ in., also viscid with glandular hairs; *stipules* filiform, setaceous; *leaflets* 7-11, nearly sessile, opposite, membranous, pale-green and sparsely hairy above, glaucous and with persistent appressed bristles beneath. *Racemes* 6-12-flowered, short peduncled, about as long as the leaves. *Flowers* small, nearly sessile. *Calyx* and *corolla* as in *I. glabra*. *Pod* ¾-1 in. long, straight, cylindrical, slightly torulose, densely clothed with appressed white hairs as well as with gland-tipped ones. *Seeds* 10-12.

The only record within the area is from the Saharanpur district. DISTRIB. Plains of the Punjab and Bengal to Ceylon, Burma, Malay Islands to N. Australia; also in Afghanistan and in Trop. Africa

8. I. trifoliata, *Linn. Cent. Pl. ii, 29; W. & A. Prod. 201; D. & G. Bomb. Fl. 59; F. B. I. ii, 96.* I. prostrata, *Willd.; Roxb. Fl. Ind. iii, 373.*

A perennial suffruticose herb. *Stems* much branched, trailing or suberect, 1-2 feet long, clothed with deciduous appressed white hairs.

Leaves digitately 3-foliolate ; *petioles* shorter than the leaflets ; *stipules* minute, setaceous ; *leaflets* ½-1 in., oblanceolate, cuneate at the base, nearly glabrous above, glaucous densely appressed-hairy and dotted with black glands beneath ; terminal leaflet sessile. *Racemes* sessile, densely 6-12-flowered, shorter than the leaves. *Flowers* small, shortly pedicelled. *Calyx-teeth* long, setaceous. *Corolla* red. *Pod* deflexed, ½-¾ in., linear, straight, somewhat 4-angular and with 2 narrow wings on either side of each suture, thinly clothed with white hairs, not torulose, 6-8-seeded.

Dehra Dun, Saharanpur, Siwaliks, Bundelkhand. DISTRIB. Himalaya up to 4,000 feet, extending to Bengal, Ceylon and Burma ; also in Java, China and N. Australia.

9. I. trita, *Linn. f. Suppl. 335 ; Roxb. Fl. Ind. iii, 371 ; W. & A. Prod. 203 ; Royle Ill. 191 ; D. & G. Bomb. Fl. 60 ; F. B. I. ii, 96.* I. cinerea, *Willd. ; Roxb. l. c. 372.*

An undershrub 2-3 feet high. *Branches* many, rigid, divaricate, thinly clothed with deciduous appressed grey hairs. *Leaves* 3 foliolate, *petiole* ¼-⅜ in. ; *stipules* minute, setaceous ; *leaflets* obovate-oblong, the side ones ½-1 in. long and subsessile, the end one stalked and usually larger than the other two. *Racemes* short and spike-like, 6-12-flowered, shorter than the leaves. *Flowers* small, nearly sessile, the upper ones usually deciduous. *Calyx-teeth* long, setaceous. *Corolla* ¼ in. long, salmon-red. *Pod* 1-1¼ in., deflexed or spreading, very firm, 4-gonous, not torulose, pointed, 8-10-seeded.

Rohilkhand, Agra and Bundelkhand. DISTRIB. Plains of Punjab and Bengal, south to Ceylon, and in Burma ; also in Trop. Africa, the Malay Islands, and in N. Australia.

10. I. subulata, *Vahl in Poir. Encycl. Suppl. iii, 150 ; F. B. I. ii, 96.* I. flaccida, *Kœn ; Roxb. Fl. Ind. iii, 375 ; W. & A. Prod. 204.*

A perennial suffruticose herb. Young parts thinly clothed with white appressed hairs. *Stems* weak, slender, subscandent. *Leaves* 5-foliolate ; *stipules* long, setaceous, erect ; *leaflets* ¾-1 in. long, stalked, oval, obtuse, apiculate, thin, finely pubescent on both surfaces, paler beneath. *Racemes* many-flowered, exceeding the leaves, elongating after flowering. *Flowers* small, rather distant. *Calyx-teeth* setaceous. *Corolla* 2-3 times the calyx, lilac. *Pods* mostly produced on the lower portion of the raceme, 1-2 in. long, deflexed from the base and curving upwards, subquadrangular, pointed, not torulose, glabrous. *Seeds* 8-12.

Merwara (Duthie). DISTRIB. South to Ceylon ; also in Trop. Africa and in America.

11. I. angulosa, *Edgew. in Journ. As. Soc. Beng. xxi (1853), 168 ; F. B. I. ii, 97.* I. subulata, var. angulosa, *Edgew. in Journ. Linn. Soc. ix, 311.*

A suffruticose perennial herb. *Branches* and membranous *leaves* thinly clothed with appressed grey hairs. *Leaflets* 5, opposite, 1-1½ in. long,

oblong, pale grey-green. *Racemes* peduncled, 4-6 in. long, much exceeding the leaves. *Pod* about ½ in. long, moniliform, beaked, 1-3-seeded.

Bundelkhand (Edgeworth), Merwara (Duthie). Similar in habit leaves and flowers to *I. subulata*, but with a very different pod.

12. I. oblongifolia, *Forsk. Fl. Ægypt.-Arab. 137; Prain & E. Baker in Journ. Bot. XL (1902), 142.* I. paucifolia, *Del.; W. & A. Prod. 201; Royle Ill 191; D. & G. Bomb. Fl. 59; F. B. I. ii, 97; Watt E. D.* I. argentea, *Buch.-Ham ex Roxb. Hort. Beng. 57; Fl. Ind. iii, 374.*

A shrub, 3-6 ft. high. *Branches* many, stout, woody, silvery-canescent. *Leaves* 3-5-foliolate, occasionally reduced to a single leaflet on the lower branches; *stipules* lanceolate, acuminate; *leaflets* alternate, ½-1 in. long, shortly stalked, narrowly oblanceolate or elliptic, slightly hairy above, densely clothed with white hairs beneath. *Racemes* 20-50-flowered, dense and spike-like, exceeding the leaves; *bracts* oval, caducous. *Flowers* small, on short curved pedicels. *Calyx* silvery; teeth short, acute. *Corolla* red, 3-4 times as long as the calyx; *standard* hairy outside. *Pods* crowded throughout the length of the rachis, ½-¾ in., deflexed and curved outwards, distinctly torulose, pointed, hairy pubescent when young. *Seeds* 6-8.

Near Delhi (Royle), Agra dist. (Munro), Bundelkhand (Edgeworth), Merwara (Duthie). DISTRIB. Plains of Punjab and Sind, C. and S. India to Ceylon; also in Java, Baluchistan, Arabia and Trop. Africa. The roots and stems are used medicinally, and the plant has been recommended as excellent fodder for sheep.

13. I. Hamiltonii, *R. Grah. in Wall. Cat. 5465; Duthie & Prain in Annals R. Bot. Gard. Calc. IX, part 1, 22, t. 29* I. atropurpurea, *F. B. I. ii, 101, in part (not of Ham.).* I. juncea, *Ham. MSS. (not of Lel.).*

A low undershrub, burnt-down annually by forest fires. *Branches* 5-8 in. thinly coated with appressed hairs. *Leaves* 1-2½ in. long; *petioles* about ½ in.; *stipules* small, caducous; *leaflets* usually 3, rarely 5, opposite, ⅛-⅝ in. long, obovate or oblong, often emarginate, membranous, pale-green sparsely appressed-pubescent on both surfaces; *stipels* minute, very caducous. *Racemes* usually all springing from the woody stock, 8-12 in. long; *peduncles* rather long, and with the flowers scattered throughout the rachis; *bracts* small, lanceolate, caducous, shorter than the pedicels. *Calyx* very small, broadly campanulate; teeth deltoid. *Corolla* about ⅛ in., pale-purple with darker lines. *Pod* 1-1½ in. long, ligulate, straight, compressed. *Seeds* 9-12, lenticular.

This remarkable plant was first discovered by Buchanan-Hamilton in the Gorakhpur district in 1814, and apparently was not collected again until 1881, in which year Mr. Gollan collected specimens in Dehra Dun; and in 1898 some excellent material was obtained by plant-collectors of the Saharanpur Botanical Department from Gorakhpur as well as from the Kheri district of N. Oudh. Hamilton's specimens, which have no leaves, were referred in the Fl. Brit. Ind. to *I. atropurpurea*, with the flowers of which those of Hamilton's plant closely agree, but the very different leaves, bracts and pods of *I. Hamiltonii* point

clearly to a different origin. Its normal condition is like that of *Erythrina resupinata*, *Grewia sapida* and of other well-known examples of shrubs, or even trees, which have become permanently dwarfed under the influence of periodical forest fires, and at present it is difficult to say what other changes may not have been produced thereby.

14. I. hirsuta, *Linn. Sp. Pl. 751; Roxb. Fl. Ind. iii, 376; W. & A. Prod. 204; F. B. I iii, 98.*

A suberect annual or biennial herb, 2-4 ft. high. *Stem* densely clothed with grey or brown pubescence. *Leaves* 2-5 in. long, short petioled; *stipules* setaceous, plumose; *leaflets* 5-11, opposite, 1-2 in. long, obovate, membranous, densely coated with appressed hairs, greyish-green above, glaucous beneath. *Racemes* 2-6 in. long, on short peduncles. *Flowers* many, crowded. *Calyx* densely pubescent; teeth long, setaceous, plumose. *Corolla* little exserted, reddish. *Pod* ½-¾ in., straight 4-angular, densely pubescent, 6-8-seeded.

Common within the area. DISTRIB. W. Himalaya, up to 4,500 ft., and throughout the plains of India to Ceylon, Burma and the Malay Penins.; also in Java, the Philippines, N. Australia, Trop. Africa and America.

15. I. articulata, *Gouan Ill. 49; Prain & E. Baker in Journ. Bot. XL (1902), 141.* I. argentea, *Linn. (not of Burm.).* I. Houer, *Forsk.* I. cœrulea, *Roxb.; Fl. Ind. iii, 377.* I. argentea var. cœrulea, *F. B. I. ii, 99; Watt E. D.*—Vern. *Nil* (Rájputána).

A shrub, 2-3 ft. high. Stems and branches more or less silvery-canescent, angled and striate. *Leaves* 1-2 in.; *petiole* ¼-½ in.; *stipules* minute, subulate; *leaflets* 3-5, or (in the Rájputána form) 7-11, opposite ½-1 in. long, obovate, rounded and apiculate at the apex, silvery-canescent on both surfaces, or almost glabrous. *Racemes* shorter than the leaves, nearly sessile, many-flowered. *Calyx* silvery-hairy; teeth deltoid, acute. *Corolla* reddish-yellow, hairy externally. *Pods* about ¼ in long, deflexed, turgid, more or less torulose, silvery-pubescent when young. *Seeds* usually 3.

Bundelkhand (Edgeworth), Merwara in Rájputána (Duthie). DISTRIB. Plains of Sind and in W. and S. India, also in Arabia, Egypt and Abyssinia. Dr. Prain is of opinion that the plant, as represented within this area, is *I. Houer* of Forskhal, a form of *I articulata* which extends from Arabia to Sind and Rájputána, and stands intermediate in characters, as it does in locality, between the Egyptian or original form of *I. articulata* and the eastern state of the same species, named *I. cœrulea* by Roxburgh. He also believes that this plant is not really indigenous in India, but may represent the remains of former cultivation. The dye yielded by it is described by Roxburgh (Fl. Ind. l.c.) as being of superior quality to that of I. tinctoria.

16 I. tinctoria, *Linn. Sp. Pl. 751 (in part); Roxb. Fl. Ind. iii, 379; W. & A. Prod 202; Royle Ill. 195; D. & G. Bomb. Fl. 59; Brand. For.*

Fl. 135; F. B. I. ii, 99; DC. L'Orig: Pl. Cult. 103; Field. & Gard. Crops, part 1, 43, t. xii; Watt E. D.—(Indigo).

A shrub, 4-6 ft. high. *Branches* angular, tough, thinly clothed with appressed white hairs. *Leaves* 2-3 in. long, stalked, turning black when dried *stipules* minute, subulate; *leaflets* 7-13, shortly stalked, ½-1 in. long, ovate-oblong, obovate or suborbicular, bluish-green and smooth above, silvery-pubescent beneath; *stipels* minute, setaceous. *Racemes* stalked; erect, spike-like, shorter than the leaves, many-flowered; *bracts* subulate. *Flowers* small, on short pedicels. *Calyx* shallow, silvery-pubescent; teeth as long as the tube. *Corolla* exserted, *standard* greenish-yellow, *wings* pink. *Pods* 1-1½ in., tapering towards the apex or blunt, straight or slightly curved, glabrous when mature, 8-12-seeded, not torulose.

The interesting 'Notes on Indigoferæ,' recently published by Dr. Prain and Mr. E. Baker in the Journal of Botany, reveal many facts, which apart from their historical and geographical interest, are of great importance in regard to indigo-culture in India. In their opinion *I. tinctoria* (taken in the wide sense) may be considered as representing 3 distinct forms, as follows:—

FORM 1. This is the wild indigo which was found in Nubia by Kotschy in 1841; and specimens agreeing with it have since been collected in Central India. The plant was probably unknown to Linnæus and also to DeCandolle. Regarded as a distinct species its correct name would be I. Bergii, *Vatke*.

FORM 2. This is the southern, or the Madras and Ceylon cultivated indigo. It is also I. tinctoria, *Linn.* Sp. Pl. (in part), and DeCandolle's var. *macrocarpa* of that species. It is found in a semi-wild state in the Jumna ravines near Agra and Muttra, also in Merwara (Rájputána), where it is not, and probably never has been, cultivated. It is called "*Jinjini*" in Rájputána, where its seeds are collected and eaten in years of scarcity, no other use being made of the plant. This form has been collected in a similar wild condition in many other localities more or less distant from its true area of cultivation.

FORM 3. I. sumatrana, *Gœrtn. Fruct. ii, 317, t., 148.* Syn. I. indica, *Lamk* —Vern. *Nil.* This is the northern cultivated form of indigo, extending from Behar and Tirhut to the Punjab, where its area meets that in which some form of *I. argentea* is grown, and southwards to the Circars, where its area approaches that of the Madras cultivated form of *I. tinctoria*. According to Dr. Prain, this is the form that was first introduced into the W. Indies from the E. Indies, and in America it is the usual one met with. It also occurs in Trop. Africa, and in Formosa. It may be distinguished botanically from the southern form by its leaflets, which are larger, and ovate-oblong or oblong instead of obovate or suborbicular. The pods also of *I. sumatrana* are shorter, thicker and blunter at the apex, and they are usually more numerous and straighter than in the Madras form. This northern form of indigo

is an important rainy-season crop within the area. Full particulars regarding its cultivation, etc. will be found in Dr. Watt's Dictionary article.

17. I. pulchella. *Roxb. Hort. Beng. 57; Fl. Ind iii, 382; W. & A. Prod. 203; D. & G. Bomb. Fl. 60; Brand. For. Fl. 136; F. B. I. ii, 101; Watt E.D.; Prain in Journ. Bot. XL (1902), 142. I. purpurascens, Roxb.; Fl. Ind. iii, 383.* I. violacea, *Roxb. l. c. 380.* I. atropurpurea, *Buch.-Ham. in Don. Prod. 244.*

A large shrub, up to 12 ft. high. *Branches* obscurely hispid, thinly coated with deciduous appressed hairs *Leaves* 3-6 in. long, shortly petioled; *leaflets* 13-21, opposite, ¾-1 in long, obovate-oblong, obtuse, often emarginate, subcoriaceous, pale-green above, glaucous beneath, thinly clothed on both sides with short appressed grey hairs; *stipels* very minute or 0. *Racemes* 1-3 in., short-peduncled. *Flowers* many, rather crowded, pedicels short; *bracts* boat-shaped, cuspidate, exceeding the buds. *Calyx* ⅛ in., silvery-canescent; teeth short, deltoid. *Corolla* ¾-1 in. or longer, bright rose; *petals* glabrous externally, *standard* reflexed. *Pod* 1¼-1½ in., turgid, glabrous, 8-12-seeded, sutures broad.

Dehra Dun and Siwalik range in sál forests, Rohilkhand and forests of N. Oudh, Bundelkhand and Merwara. DISTRIB. Salt range in the Punjab, W. Himalaya up to 5,000 ft. in Kumaon, and in the hilly parts of C., W. and S. India, also in Burma. Flowers during the cold season. The root is used medicinally, the pink flowers are eaten as a vegetable, and the branches are useful for fences.

36. CICER, Linn.; Fl. Brit. Ind. ii, 176.

Annual herbs. *Leaves* pinnate, rigid; *leaflets* and *stipules* strongly veined, deeply toothed. *Flowers* solitary in the axils of the leaves. *Calyx-tube* oblique; teeth lanceolate, subequal. *Corolla* exserted; *standard* broad, exceeding the wings and keel, *wings* free from the keel. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* sessile, 2- or many-ovuled; *style* incurved, beardless, *stigma* capitate. *Pod* sessile, oblong, turgid, narrowed into the persistent style.—Species 14, Mediterranean, and in W. & C Asia.

C. arietinum, *Linn. Sp. Pl. 738; Roxb. Fl. Ind. iii, 324; W. & A. Prod. 235; Royle Ill. 200; F. B. I. ii, 176; DC. L'Orig., Pl. Cult. 258; Field & Gard. Crops I, 33, t. viii, Watt E. D.*—Vern. *Chana.* (Gram, or chick-pea).

A viscid much-branched annual. *Leaves* 1-2 in. long, with usually a terminal leaflet; *stipules* small, obliquely ovate, toothed; *leaflets* about ¼ in. long, ovate oblong or obovate, deeply cut. *Peduncle* ¼-¾ in., jointed about the middle, deflexed after flowering. *Calyx* ¼-⅓ in., teeth linear. *Corolla* scarcely half as long again as the calyx, pink, blue or

white. *Pod* ¾-1 in., turgid, pubescent, topped by the persistent base of the style. *Seeds* obovate or subglobose, beaked, reddish-brown, black or white.

Largely cultivated in North-West and Cent. India during the cold season Although not now to be found in a truly wild state, its original home was most probably in some part of S. E. Europe. Two distinct kinds are grown in this part of India, one with reddish seeds, and a smaller kind with seeds of a light brown colour. There is also one with nearly black seeds, and another with large white seeds, known as "Cabuli;" the last-named is, however, rarely grown for profit. Gram is used chiefly in Upper India as food for horses, but is also eaten to a large extent by the poorer classes, either parched or boiled. The Horse-gram of Madras is *Dolichos biflorus*. The stalks and leaves, after the grain is removed, constitute a valuable fodder for cattle. The plant, when growing, exudes an acid liquid, which is obtained by collecting the dew from the foliage. It is found to contain oxalic, acetic and malic acids, and is much valued by natives for its medicinal properties.

37. LENS, Gren. & Godr.

Erect or subscandent herbs. *Leaves* pinnate, the rachis ending in a bristle or tendril or in a terminal leaflet; *stipules* semisagittate; *leaflets* of 2-many pairs, entire, exstipellate. *Flowers* solitary or in racemes, on axillary peduncles. *Calyx-lobes* elongate, subequal. *Standard* broad; *wings* adherent to the keel; *keel* shorter than the wings. *Staminal-tube* with an oblique mouth. *Ovary* subsessile, 2-ovuled; *style* inflexed, bearded with minute hairs on its inner face. *Pod* compressed, continuous within, 1-2-seeded.—Species 5 or 6. Mediterranean and W. Asian.

L. esculenta, *Mœnch. Meth. 131; Watt E. D.* Ervum Lens, *Linn.; Royle Ill. 200; F. B. I. ii, 179; DC. L'Orig. Pl. Cult. 257; Field & Gard. Crops II, 13, t. xxxi.* Cicer Lens, *Willd.; Roxb. Fl. Ind. iii, 324.*—Vern. *Masur.* (The Lentil.)

A small erect soft pubescent herb, branching from the base. *Leaflets* of 4-6 pairs, sessile, lanceolate, often mucronate; rachis ending in a short bristle. *Racemes* 2-4-fld; *peduncles* about as long as the leaves, extending beyond the flowers. *Calyx-teeth* linear, twice as long as the tube, silky. *Corolla* a little longer than the calyx-teeth, pale purple. *Pod* rhomboid-oblong, about ½ in. long, smooth. *Seeds* usually 2, compressed, grey, with minute spots.

The lentil is grown as a cold-weather crop throughout India, and very extensively in the Central Provinces. In Upper India the largest areas occupied by this crop are in the Terai districts and those of Rohilkhand. According to DeCandolle the plant originated in S. E.

Europe and in temperate Western Asia, where its cultivation was first undertaken in very early prehistoric times, and it was unknown in India before the invasion of the Sanscrit-speaking races. It is considered to be one of the most nutritious of the pulses. In India it is eaten as *dál*, and it also forms one of the constituents of a dish called '*kichri*'. A well-known prepared food, called '*Revalenta*', is said to be largely composed of the flower of this pulse. The young pods are eaten as a vegetable, and the leaves and stalks are given as fodder to cattle.

38. VICIA, Linn.; Fl. Brit. Ind. ii, 176.

Annual or perennial herbs. *Leaves* pari-pinnate, ending in twisted tendrils. *Flowers* subsessile, or in peduncled racemes in the axils of the leaves. *Calyx-tube* campanulate, often oblique; teeth long, often unequal. *Corolla* more or less exserted, *standard* broad, *keel* shorter than the wings. *Stamens* 2-adelphous, the mouth of the sheath very oblique, *anthers* uniform. *Ovary* nearly sessile, 2-many-ovuled; *style* short, filiform or slightly flattened, its apex dorsally bearded or pilose all round, *stigma* capitate. *Pod* flattish, continuous within.—Species about 120, mostly in temperate parts of the world.

Style finely downy all round near the tip, pod 2-seeded	1. *V. hirsuta.*
Style bearded on lower side near the tip, pod more than 2-seeded	2. *V. sativa.*

1. V. hirsuta. *S. F. Gray Nat. Arr. Brit. Pl. ii, 614; F. B. I. ii, 177; Field & Gard. Crops iii, 63; Watt E. D.* Ervum hirsutum, *Linn.; Roxb. Fl. Ind. iii, 323; Royle Ill. 200; W. & A. Prod. 235.*—Vern. *Masur chana, gegla* (Hairy Tare).

A hairy climbing annual. *Stipules* semisagittate, often toothed at the base; *leaflets* 5-8 pairs, ½-1 in. long, truncate. *Peduncles* longer than the leaves, 3-6-flowered. *Corolla* scarcely exserted. *Style* pubescent all round. *Pod* ½-¾ in., oblong-rhomboid, turgid, hairy, 2-seeded, turning black.

Abundant within the area as a weed of wheat-fields. DISTRIB. Plains of Punjab and Bengal, and on the W. Himalaya up to 6,000ft.; also on the Nilgiris. Most likely originally introduced from Europe, where the plant is common. It is said to be sometimes cultivated in India for fodder. The seeds are often found as an impurity in exported wheat.

2. V. sativa. *Linn Sp. Pl. 736; Roxb. Fl. Ind. iii; 323; Royle Ill. 190; F. B. I. ii, 178; DC. L'Orig. Pl. Cult. 86; Watt E. D.*—Common Vetch or Tare.

An annual with slender suberect stems, glabrous or obscurely downy. *Stipules* small, obliquely lanceolate, deeply toothed; *leaflets* 8-12;

those of the upper leaves ¾-1 in. long, ligulate, of lower shorter and broader. *Flowers* solitary or geminate. *Calyx* ⅓ in., teeth lanceolate-subulate. *Corolla* reddish-blue, twice the calyx. *Style* bearded below the stigma on lower side. *Pod* 1½-2 in., glabrescent, 8-10-seeded.

This plant is found within the area as a weed of cultivation, also in the Punjab and Bengal, ascending to 7,500 ft. on the W. Himalaya. It is wild throughout the greater part of Europe, and was no doubt introduced into India from that direction.

VAR. angustifolia, *Linn. (sp.)*; *Royle Ill. 200; F. B. I. l.c.; Watt E. D.*— Smaller and more diffuse. *Leaflets* shorter, those of the lower leaves deeply emarginate. *Flowers* and *pods* smaller. Abundant as a weed in cultivated ground throughout Northern India. It is found also in Europe and N. Africa. It is mentioned by Royle as being cultivated in N. W. India and that the seeds, called '*khandi*,' are eaten by the natives.

V. Faba, *Linn.; Roxb. Fl Ind. iii, 323; Royle Ill. 200; Field & Gard. Crops iii, 4; Watt E. D.* Faba vulgaris, *Mœnch.; DC. L'Orig. Pl Cult. 253.*—Vern. *Bakla.* (Garden or Broad bean).

This bean, according to DeCandolle, occupied as a wild plant two distinct areas, one being to the south of the Caspian, and the other in N. Africa. It was cultivated in Europe in prehistoric times, and afterwards spread to China and Japan. Many authors are of opinion that it may originally have been derived from *V. narbonensis, Linn.*, a native of S. E. Europe and N. Africa, and botanically its nearest ally.

In addition to the ordinary kind imported from Europe, there exists in India a very distinct acclimatized variety, called *Seo-chana*. This is grown in native gardens in the plains of N. India, also near villages on the W. Himalaya, from Kashmir to Kumaon, and sometimes up to considerable elevations, where, owing to the short summer, the leaves only are available as food and are used as a vegetable. This variety differs from the ordinary garden bean by its smaller leaflets and pods; the seeds also are much smaller, and quite round and black, like a large dark-coloured pea. It was most probably introduced into N. India from China. Roxburgh mentions it as being cultivated in Nepal.

39. LATHYRUS, Linn.; Fl. Brit. Ind. ii, 179.

Annual or perennial herbs with paripinnate entire leaves ending in a tendril or bristle. *Flowers* racemed or solitary. *Calyx-tube* campanulate, oblique; teeth long, or the upper short. *Corolla* more or less exserted, *standard* broad, *keel* shorter than the wings. *Stamens* 2 adelphous, mouth of tube not oblique, *anthers* uniform. *Ovary* subsessile or stalked, many-ovuled; *style* flattened at the apex, bearded on the inner side, *stigma* capitate. *Pod* terete or

flattish, continuous within.—Species about 100, chiefly in the N. Temperate zone.

Leaflets abortive, flowers yellow . .	*1. L. Aphaca.*
Leaflets 2, flowers red, bluish or white.	
Pods oblong, winged on the back .	*2. L. sativus.*
Pods linear, not winged . . .	*3. L. sphæricus.*

1. L. Aphaca, *Linn. Sp. 1 l 729; Roxb. Fl. Ind. iii, 322; Royle Ill. 200; F. B. I. ii, 179; Watt E. D.*

An annual with slender wingless much branched stems. *Stipules* in pairs, appressed to the stem, leaf-like, hastate, truncate, entire; *leaflets* abortive. *Flowers* 1-2, on a long peduncle. *Calyx* ¼ in.; teeth equal, lanceolate, exceeding the tube. *Corolla* yellow, twice the calyx. *Pod* linear-oblong, wingless, 4-6-seeded.

Common within the area, especially in cultivated ground. DISTRIB. Punjab, Bengal and C. India, ascending to the temperate zone on the W. Himalaya. The plant is used in some places for cattle-fodder.

2. L. sativus, *Linn. Sp. Pl. 730; Roxb. Fl. Ind. iii, 321; Royle Ill. 200; F. B. I. ii, 180; DC. L'Orig. Pl. Cult. 88; Field & Gard Crops II, 15, t. 32; Watt E. D.*—Vern. *Kasári, Kassar, tinra, latri* (*Azamgarh*), *mattar.*

A glabrous much-branched annual with winged stems. *Leaves* ending in 3-fid tendrils; *stipules* broad, entire, acuminate, semi-sagittate; *petiole* about 1 in., winged; leaflets 2, linear-lanceolate, acuminate, entire. *Peduncles* longer than the petioles, 1-flowered. *Calyx*-teeth spreading in flower, lanceolate, about twice as long as the tube. *Corolla* ¾ in., reddish-purple or blue, rarely white; *standard* rather broader than long, emarginate. *Pod* 1½ in. long, with a conspicuous wing on either side of the dorsal suture. *Seeds* 4-5, compressed, brown or yellowish, marbled with red.

Extensively cultivated as a cold-weather crop within the area, especially in the eastern districts of the United Provinces. It is grown also in the Punjab, Bengal and in C. and S. India, and on the Himalaya up to 4,000 ft. According to DeCandolle this species was indigenous, before cultivation, in the region extending from the south of the Caucasus to the north of India. The pulse, which is largely consumed by the poorer classes, especially in times of scarcity, has a bad reputation for causing paralysis; and horses and cattle also suffer in a similar manner. The poisonous action of the seed is attributed to the presence of a volatile alkaloid, which, as Dr. Watt suggests, may not be present in properly cooked preparations of the grain. The plant is often much used as fodder.

3. L. sphærious. *Retz. Obs. iii, 39; F. B. I. ii, 150.* L. angulatus, *Benth. in Royle Ill. 200.*

A slender glabrous much branched annual. *Stems* without wings. *Stipules* linear, semi-sagittate, about equalling the winged petiole; *leaflets* 2, about 3 in. long, very narrow. *Peduncle* about equalling the petiole, 1-flowered, jointed near the middle, *bracteoles* linear. *Calyx* less than ¼ in., teeth linear, as long as the tube. *Corolla* reddish, twice the calyx. *Pod* linear, wingless, many-seeded. *Seeds* globular, smooth.

Abundant within the area, usually in grassy places. DISTRIB. Plains of Punjab and Bengal, ascending to 5,500 ft. on the W. Himalaya. Found also in Abyssinia, and in S. and E. Europe.

40. PISUM, Linn.; Fl. Brit. Ind. ii, 181.

This genus differs from *Lathyrus* principally by its thick laterally compressed dilated style.—Species about 6, inhabiting the Mediterranean region and W. Asia.

Seeds compressed, marbled . . .	*1. P. arvense.*
Seeds globose, of uniform colour . . .	*2. P. sativum.*

1. P. arvense, *Linn. Sp. Pl. 727; Royle Ill. 200; F. B. I. ii, 181; DC. L' Orig. Pl. Cult. 262; Field & Gard. Crops II, 17, t. 32 B; Watt E. D.*—Vern. *Desi-mattar, chota mattar* (Field Pea.)

A smooth glaucous annual. *Stipules* large, ovate, semicordate, irregularly toothed at the base; *leaflets* 4-6, the common petiole ending in a branched tendril. *Peduncles* 1-few-flowered, equaling or exceeding the stipules. *Standard* pink, *wings* deep-purple. *Pod* reticulate. *Seeds* angled, smooth, greenish-yellow mottled with red.

Largely grown as a cold-weather crop in many districts of the Upper Gangetic Plain. Royle regarded it as indigenous in the Kadir land of the Jumna near Delhi, where it is known as '*urra mattar.*' DeCandolle, however, came to the conclusion that Italy must have been its original home, as it is now undoubtedly wild in that country. The seed very much resembles that of *kasári* (Lathyrus sativus). It is eaten by the natives as *dál*. The straw is much valued for fodder.

2. P. sativum, *Linn. Sp. Pl. 727; Roxb. Fl. Ind. iii, 331; Royle Ill. 200; F. B. I. ii, 181; DC. L' Orig. Pl. Cult. 262; Field & Gard. Crops II, 17, t. 32A; Watt E.D.*—Vern. *Gol-mattar, bara-mattar.* (Garden Pea.)

A more robust plant than the preceding. *Flowers* usually white, on longer peduncles. *Pods* broader. *Seeds* round, white.

Extensively cultivated within the area, but chiefly in the western portion. Compared with the *Desi-mattar* it is a far more valuable and prolific

crop. Regarding its origin, DeCandolle was of opinion that before it was ever cultivated it existed as a wild plant in W. Asia, and that it probably found its way to N. India before the arrival of the eastern Aryans. It is not at the present time, however, known anywhere as a wild plant. By some authors it is regarded as merely a variety or subspecies of P. *arvense*, modified by culture.

41. ABRUS, Linn.; Fl. Brit. Ind. ii, 175.

Climbing shrubs. *Leaves* with numerous deciduous leaflets. *Flowers* small, in dense racemes on axillary peduncles or short branches. *Calyx* campanulate, equal, teeth very short. *Corolla* much exserted; *standard* ovate, acute, adhering below to the staminal tube, *wings* narrow, *keel* curved. *Stamens* 9. united in a tube slit above, *anthers* uniform. *Ovary* subsessile, many-ovuled; *style* short, incurved, beardless, *stigma* capitate. *Pod* oblong or linear-oblong, flat or turgid, moderately firm, thinly septate. *Seeds* polished.—Species 6, cosmopolitan in the tropics.

Pods oblong, turgid, 3-5-seeded . .	1. *A. precatorius.*
Pods linear, flat, 8-12-seeded .	2. *A. pulchellus.*

1. A. precatorius, *Linn. Syst. ed. XII, 472; Roxb. Fl. Ind. iii, 259; W. & A. Prod. 236; D. & G. Bomb. Fl. 76; Brand. For. Fl. 139; F.B.I. ii, 175; Watt E.D.* —Vern. *Gunchi, Chuntli and ratgiri,* (Dehra Dun).

A woody climber with many slender glabrous or thinly silky branches. *Leaves* 2-3 in. long; *leaflets* pari-pinnate, in 10-20 opposite pairs, about ½ in. long, ligulate-oblong, membranous, glabrous above, thinly silky beneath. *Racemes* crowded, many-flowered, usually shorter than the leaves. *Calyx* ⅛ in., thinly silky. *Corolla* 3-4 times the calyx, pink or white. *Pod* 1-1½ in. long, oblong, turgid, 3-5-seeded. *Seeds* subglobose, usually scarlet with a black hilum, sometimes white with black hilum, or uniformly black or white.

Common in all the forest tracts within the area. DISTRIB. Throughout the greater part of India and in Ceylon, ascending the outer Himalaya to 3,500 ft.; also in Burma, Siam and in the Andaman and Nicobar Islands, where it is abundant on the sea-coasts. Cosmopolitan in the tropics, and often planted. Flowers in Aug. and Sep. and the fruit ripens during the cold season. The root is used medicinally as a substitute for liquorice, and the leaves and seeds are also medicinal. The seeds, called *rati*, are largely used as weights by Indian jewellers. They are also made into rosaries, hence the name 'precatorius.'

2. A. pulchellus, *Wall. Cat. 5319; F. B. I. ii, 175.*

Very similar to the preceding in habit, but with fewer and larger leaflets; the flowers are more laxly racemose, and the peduncles are much longer

than the leaves : the pods are larger, flat and somewhat incurved, and the valves are thinner ; the more numerous seeds are compressed, and are black or of a light brown colour.

Dehra Dun. DISTRIB. Outer Himalaya from Kumaon to Sikkim, Chittagong, Burma, Andaman Islands, Ceylon, Malay Penins. and Islands ; also in S. Africa. Flowers in Aug. and Sep.

42. DALBERGIA, Linn. f. ; Fl. Brit. Ind. ii, 230.

Trees or climbing shrubs. *Leaves* odd-pinnate, with alternate subcoriaceous leaflets. *Flowers* copious, small, in terminal or lateral panicles. *Calyx* campanulate ; teeth 5, distinct, usually short. *Corolla* exserted ; *standard* broad ; *keel* obtuse, with its petals joined only at the tip. *Stamens* 9-10, 1-adelphous, or 2-adelphous ; *anthers* minute, terminal, basifixed, with the cells back to back, and the slit mostly short and apical. *Ovary* stalked, few-ovuled ; *style* short, incurved ; glabrous, *stigma* capitate. *Pod* oblong or strap-shaped, usually thin and flat, 1-4-seeded, indehiscent, not thickened or winged at the sutures.—Species 60-70, cosmopolitan in the tropics.

Stamens 9, in one bundle. Large trees.
- Leaflets obtuse or emarginate, flowers distinctly stalked . . . . . 1. *D. latifolia.*
- Leaflets acuminate, flowers nearly sessile. . 2 *D. Sissoo.*

Stamens 10, in two bundles of 5 each.

Trees.
- Racemes in large lax terminal and axillary panicles with spreading branches. . 3. *D. lanceolaria*
- Racemes in compact terminal panicles . 4. *D. paniculata.*
- Racemes in compact axillary panicles, leaflets hairy on both surfaces. . . 5. *D. sericea.*

A climber, flowers in compact pubescent panicles . . . . 6. *D. volubilis.*

1. D. latifolia, *Roxb. Cor. Pl. ii, 7, t. 113 ; Fl. Ind. iii, 221 ; W. & A. Prod. 264 ; D. & G. Bomb. Fl. 77 ; Brand. For. Fl. 149 ; F. B. I. ii, 231 ; Watt E. D. ; Prain in Journ. As. Soc. Beng. LXX, part. 2, 41.*—Vern. Sitsál, *shisham.* (Blackwood or Rosewood of S. India.)

A large erect deciduous tree, glabrous in all its parts. *Leaves* 4-6 in. long. 3-7-foliolate, rachis straight ; *leaflets* 1½-2½ in. long, on long stalks, broadly elliptic, orbicular or elliptic-obovate, obtuse and sometimes emarginate, cuneate at the base, often glaucous beneath. *Flowers* whitish, in lax axillary panicles, which are shorter than the leaves, *pedicels* as long as the calyx. *Calyx*-teeth obtuse, shorter than the tube. *Corolla* twice the calyx. *Stamens* 9. *Pod* oblong-lanceolate, 1-4-seeded.

Forests of N. Oudh, Bundelkhand and Merwára. DISTRIB. Nepal, Sikkim, Chota Nagpur, Behar and in W. and S. India. Flowers in April with the new foliage. The heartwood is purple streaked with black. It is very much valued as a furniture wood. The foliage is used as fodder.

2. D. Sissoo, *Roxb. Hort. Beng. 53 ; Fl. Ind. iii, 223 ; W. & A. Prod. 264 ; D. & G. Bomb. Fl. Suppl. 24 ; Brand. For. Fl. 149, t. 24 ; F. B. I. ii, 231 ; Watt E. D. ; Prain, in Journ. As. Soc. Beng. LXX, part ii, 40.*—Vern. *Shisham, Sissu, táli* (Punjab).

A large deciduous tree with grey bark ; young parts downy. *Leaflets* 3-5, alternate, obliquely ovate, acuminate, firm, at length quite glabrous. *Flowers* in panicled racemes which are much shorter than the leaves, branches densely pubescent. *Calyx* ⅛ in. ; teeth obtuse, shorter than the tube. *Corolla* yellowish-white, twice the calyx ; *standard* with a long claw. *Stamens* 9. *Ovary* pubescent. *Pod* 1½-3 in. by ¼-½ in., strap-shaped, obtuse, narrowed below into a stalk, 2-3-seeded.

Wild within the area, in gravelly river-beds in Dehra Dun and eastward along the foot of the Himalaya, also in Merwára. DISTRIB. Baluchistán, W. Himalaya up to 4,000 feet, and in the Terai of Nepal and Sikkim to Upper Assam. Extensively planted throughout India as a roadside tree, and for the sake of its excellent timber. The tree thrives best on low-lying sandy tracts The new foliage begins to appear in Feb., and the flowers open between March and May. The pods ripen during the cold season, and remain on the tree for a long time. The strong elastic wood seasons well, and is largely used for furniture ; the tree is often lopped for fodder, and near towns the fallen leaves are frequently collected for fuel by native confectioners.

3. D. lanceolaria, *Linn. f. Suppl. 316 ; D. & G. Bomb. Fl. 87 ; Brand. For. Fl. 151 ; F. B. I. ii, 235 ; Watt E. D. ; Prain in Journ. As. Soc. Beng. LXX, part ii, 52* D. frondosa, *Roxb. ; Fl. Ind. iii, 226 ; W. & A. Prod. 206 (in part).* D. zeylanica, *Roxb. ; Fl. Ind. iii, 228 ;* D. hircina, *Ham. in Wall. Cat. 5371 A.*—Vern. *Takoli, bithua, pássi* (Merwára).

A large deciduous tree with glabrous branches. *Bark* smooth, greenish-grey. *Leaves* 3-6 in. long ; *leaflets* 11-15, not turning black when drying, 1-2 in. long, ovate or obovate, rounded at the base and often emarginate at the apex, rigidly subcoriaceous, pale and rather glaucous beneath. *Flowers* dull-white or pinkish, unilateral on the spreading branches of large lax axillary and terminal panicles. *Calyx* dull-purple, silky outside ; upper teeth obtuse, the 3 lower ones rather longer and acute, *Standard* broadly obovate, clawed ; *keel* shorter than the wings. *Stamens* 10, in two bundles of 5 each. *Pod* 2-3 in. long, stalked, narrowed at both ends, flexible, glabrous, bright brown, usually 1-seeded, valves reticulate over the seed.

Dehra Dun and Sivalik range (scarce), forests of N. Oudh (Duthie's collector), Bundelkhand, Ajmer (Jacquemont), Merwara (Duthie). DISTRIB. Valleys of the Outer Himalaya, Sikkim Terai, Behar, Chota

Nagpur and south to Ceylon. Flowers in May and June. The wood is white or yellowish and without heartwood. The leaves, bark and root are used medicinally.

4. D. paniculata. *Roxb. Cor. Pl. ii, 8, t. 114; Fl. Ind. iii, 227; W. & A. Prod. 265; D. & G. Bomb. Fl. 78; Brand. For. Fl. 150; F. B. I. ii, 236; Watt E.D.; Prain in Journ. As. Soc. Beng. LXX, part ii, 51.*—Vern. *Dhobein* (Bundelkhand).

A tall erect deciduous tree, the ultimate branches silky-pubescent. *Leaflets* similar in shape, size and texture to those of *D. lanceolaria*, but turning black in drying. *Flowers* bluish white, in shortly pedicelled brown silky racemes arranged in compact and usually terminal panicles. *Calyx* ⅛ in., teeth as long as the tube, acute, densely silky. *Standard* with a narrow cordate base. *Stamens* 10, in two bundles of 5 each. *Pod* as in D. *lanceolaria*.

Siwalik range (scarce), N Oudh, Bundelkhand. DISTRIB. W. and S. India, Burma and Shan Hills. Flowers April and May with the new foliage. The structure of the wood is remarkable in having narrow concentric layers of dark-coloured bast alternating with broad layers of white wood, so that when planks are cut from the trunk they fall to pieces.

5. D. sericea, *G. Don. Syst. ii, 375; Prain in Journ. As. Soc. Beng. LXX, part ii, 51.* D. hircina, *Wall. Cat. 5871 B. (not of Ham.); Benth. in Journ. Linn. Soc. iv, Suppl. 46; F. B. I. ii, 238; Watt E.D.* D. stenocarpa, *Kurz.; F.B.I. ii, 238.* D. assamica, *Benth.; F.B.I. ii, 235 (in part).*

A small tree, with the branchlets, petioles and inflorescence rusty-tomentose. *Leaflets* 17-25, ovate or elliptic, 1-1½ in. long, obtuse or emarginate at the apex, clothed on both surfaces with appressed pubescence. *Flowers* ¼ in. long, pale lilac or whitish, in short congested axillary panicles; *pedicels* equalling the calyx. *Calyx*-teeth nearly as long as the tube. *Standard* obovate, *keel* shorter than the wings. *Stamens* 10, in bundles of 5 each. *Pods* numerous, 1-2 in. long, stalked, linear, glabrous, not veined over the seeds, 1-3-seeded.

Dehra Dun at Sahansradhàra. DISTRIB. Outer Himalaya from Garhwal to Sikkim and Bhutan, up to 5,500 ft. Flowers in April and May.

6. D. volubilis, *Roxb. Cor. Pl. ii, 49, t. 191; Fl. Ind. iii, 231; W. & A. Prod. 265; D. & G. Bomb. Fl. 78; Brand. For. Fl. 152; F.B.I. ii, 235; Watt E. D.; Prain in Journ. As. Soc. Beng. LXX, part ii, 54.* D. confertiflora, *Benth.; F. B. I. ii, 233 (in part).*

A large woody climber, the branches often twisted into spiral hooks, glabrous except the inflorescence. *Leaves* 4-5 in. long; *leaflets* 11-13, obovate or ovate-oblong, often mucronate at the slightly retuse apex, ¾-1 in. long, dark green above. *Flowers* in copious terminal and axillary panicles, with pubescent horizontal or decurved branches bearing densely corymbose cymes; *pedicels* pubescent; *bracts and bracteoles* persistent. *Calyx* densely velvety; teeth lanceolate, the lowest longer than the rest. *Corolla* 2-3 times the length of calyx, pale-blue;

standard reflexed at the base of the orbicular emarginate limb. *Stamens* 10, in two bundles of 5 each. *Pod* like that of *D. lanceolaria*.

Forests of N. Oudh (Wallich, Duthie), Bundelkhand (Edgeworth). DISTRIB. Eastward along the foot of the Himalaya to Assam, Burma and the Shan Hills, and south from Bengal to C. W. and S. India. Flowers January to March.

43. PTEROCARPUS, Linn. ; Fl. Brit. Ind. ii, 238.

Erect trees. *Leaves* with alternate coriaceous exstipellate leaflets. *Flowers* yellowish, in copious panicled racemes ; *bracts* and *bracteoles* minute, caducous ; *pedicels* distinctly articulated at the apex. *Calyx* turbinate, curved before expansion, the teeth short. *Petals* exserted, with long claws ; *standard* and *wings* crisped ; *keel* obtuse, its petals scarcely or not at all coherent. *Staminal-sheath* slit both above and below, or above only, the upper stamen often nearly or quite free ; *anthers* versatile. *Ovary* stalked, 2-ovuled, *style* incurved, *stigma* terminal. *Pod* orbicular, rarely more than 1-seeded, indehiscent, with a broad rigid wing, the point turned down to opposite the base or near it.—Species about 15, cosmopolitan in the tropics.

P. Marsupium, *Roxb. Cor. Pl. ii, 9, t. 116 ; Fl. Ind. iii, 234 ; W. & A. Prod. 266 ; D. & G. Bomb. Fl. 76 ; Brand. For. Fl. 152 ; F.B.I. ii, 239 ; Watt E. D. ; Prain in Journ. As. Soc. Beng. LXVI, part 2 (1897), 455 ; Ind. For. XXVI (1900), Suppl. 15.*—Vern. *Bija-sál.*

A tall or medium-sized deciduous tree. *Leaves* 7-9 in. ; *leaflets* 5-7 ; firmly coriaceous, sparingly clothed beneath with persistent appressed hairs, 1½-5 in. long and ¾-3 in. wide, elliptic or ovate to lanceolate, obtuse acute or acuminate, the end leaflet the largest ; nerves 15-20 pairs, slightly prominent beneath. *Flowers* in large much-branched terminal panicles ; rachis and pedicels rusty-puberulous ; *pedicels* $\frac{1}{10}$ in., with 2 small ovate caducous bracteoles at the apex. *Pod* orbicular, stipe $\frac{1}{10}$ in. long, *style* at some distance above the base, periphery of pod between stipe and style convex.

Forests of Pilibhit, N. Oudh, Gorakhpur and Bundelkhand. DISTRIB. Kumaon Terai, Rajmahal Hills, and in C. W. and S. India to Ceylon. Flowers during the rainy season. Dr. Prain, who has specially studied this genus, recognizes two rather marked varieties, each of which shows two distinct geographical forms. The tree, as represented within the area of this flora, belongs to the form *acuta* of his report on the Indian species of *Peterocarpus*, published as a Supplement to the *Indian Forester* for 1900. The bark of this and other species yields a valuable astringent gum, which is sold under the name of 'Indian Kino'. The timber is highly prized, and the foliage affords excellent fodder for cattle. The valuable Burmese tree, known as *Padauk*, has been identified by Dr. Prain as *P. macrocarpus, Kurz.*

44. PONGAMIA, Vent.; Fl. Brit. Ind. ii, 239.

A tree. *Leaves* odd-pinnate; *leaflets* opposite, exstipellate. *Flowers* racemed. *Calyx* campanulate, nearly truncate. *Corolla* much exserted; *standard* broad, silky; *keel* obtuse, the petals cohering at their tips. *Stamens* 1-adelphous, the upper filament free low down; *anthers* oblong, versatile. *Ovary* subsessile, 2-ovuled; *style* incurved, glabrous, *stigma* capitate. *Pod* woody, somewhat turgid, oblong, indehiscent, not winged nor thickened at the sutures. A single species, mostly found on sea-coasts from the Mascerene Islands to Malaya, N. Australia and W. Polynesia.

P. glabra, *Vent. Jard. Malm. 28, t. 28; W. & A. Prod. 262; D. & G. Bomb. Fl. 77; Royle Ill. 191; Brand. For. Fl. 153; F. B. I. ii, 240; Wat. E.D.; Prain in Journ. As. Soc. Beng. LXVI, 94, 456.* Galedupa indica *Lamk.; Roxb. Fl. Ind. iii, 239.*

A moderate-sized glabrous almost evergreen tree. *Bark* soft, greyish-green. *Leaves* 8-10 in. long, pale-green; *leaflets* usually 5-7, oblong or ovate, obtuse or shortly acuminate, 2-4 in. long, subcoriaceous, midrib and lateral nerves rather prominent beneath. *Flowers* in simple pedunculed axillary racemes nearly as long as the leaves; nodes tumid, bearing 2-4 pedicels; rachis and pedicels sparsely puberulous; *pedicels* with 2 bracteoles at the base, and with 2 others towards the apex. *Calyx* widely campanulate, mouth truncate. *Corolla* ½ in. or less, white tinged with violet or pink; *standard* orbicular, silky on the back, subcordate and 2-auriculate at the base. *Ovary* finely pubescent. *Pod* 1½-2 in long, with a short decurved point, turgid, woody, glabrous, brownish-green, 1-rarely 2-seeded. *Seeds* white, marbled with brownish lines.

Forests of N. Oudh, Bundelkhand, Merwára. Often planted in other parts of the area. DISTRIB. Along the base of, and in outer valleys of the Himalaya from the Ravi eastwards to Chittagong, C. and S. India and in Ceylon; also very common as a sea-coast tree in the Andaman and Nicobar Islands, Malay Penins. and Islands, extending to China and N. Australia. Dr. Prain is of opinion that it only occurs in inland districts as a planted tree. Flowers in April and May, and the pods ripen during the following April. The seeds yield a valuable medicinal oil, and the leaves and root are also used medicinally. The leaves are given as fodder to cattle. The wood is white, turning yellow on exposure, not durable.

45. DERRIS, Lour.; Fl. Brit. Ind. ii, 240.

Climbers, rarely erect trees. *Leaves* odd-pinnate; *leaflets* opposite, usually exstipellate *Flowers* copious, usually fascicled, showy, in axillary or terminal racemes or panicles. *Calyx*

campanulate, almost truncate. *Corolla* much exserted, *standard* broad; *keel* obtuse, the petals cohering slightly. *Stamens* usually 1-adelphous, *anthers* versatile. *Ovary* sessile, few-ovuled; *style* incurved, filiform, *stigma* capitate. *Pod* rigid, thin, flat, indehiscent, oblong if 1-seeded, strap-shaped if few-seeded, with a distinct wing down the upper or both sutures. Species about 40, found in the tropics of both hemispheres.

D. scandens, *Benth. in Journ. Linn. Soc. iv, Suppl. 103; Brand. For. Fl. 154; F.B.I. ii, 240; Watt E. D.* Dalbergia scandens, *Roxb.; Fl. Ind. iii, 232; W. & A. Prod 264.* Brachypterum scandens, *Benth.; D. & G Bomb. Fl. 76.*

A large climber with the branchlets at first obscurely grey-downy. Leaf-rachis about 3 in.; *leaflets* 9-11, on short stalks, 1-2 in. long, oblong or obovate-oblong, subcoriaceous, dark-green, polished and glabrous above, sparsely grey-pubescent beneath. *Flowers* in long axillary short-pedunculed racemes which are much longer than the leaves; nodes distant, swollen, often bearing flowers in fascicles; rachis and pedicels finely appressed-pubescent; *pedicels* with 2 minute bracteoles under the calyx. *Calyx* widely campanulate, thinly silky, teeth obscure *Corolla* white or pale-rose, 3 times the calyx. *Ovary* finely puberulous, *ovules* 6-8. *Pod* 1-3 in. long, linear-lanceolate, clothed with fine silky hairs, somewhat turgid over the seeds, 1-½ seeded.

Forests of N. Oudh. DISTRIB. Cent. and S. India to Ceylon, Bengal, Assam, Andaman and Nicobar Islands, Burma, Malay Penins. and Islands to S. China and N. Australia. Flowers during the hot season. The bark yields a coarse fibre.

46. ZORNIA, Gmel.; Fl. Brit. Ind. ii, 147.

Annuals with large geminate coriaceous bracts and dotted exstipellate leaflets in 1-2 opposite pairs. *Flowers* in lax racemes. *Calyx* minute; upper teeth short, connate, lowest shorter than the two middle ones. *Corolla* much exserted, *standard* broad; *keel* incurved, acute. *Stamens* 1-adelphous, *anthers* dimorphous. *Ovary* sessile, many-ovuled; *style* filiform, incurved; *stigma* minute, capitate. *Pod* of several small round flattened finely muricated 1-seeded indehiscent joints.—Species 11, chiefly American.

Z. diphylla, *Pers. Syn. ii, 318; F.B.I. ii, 147; Watt E. D.* Hedysarum diphyllum, *Linn.; Roxb. Fl. Ind. iii, 353.* Z. angustifolia, *Sm.; W. & A. Prod. 217; D. & G. Bomb. Fl 62.*

A diffuse annual with slender zigzag wiry branches. *Leaves* stalked; rachis ¼ in., purberulous; *leaflets* 2 lanceolate, acute, glabrous, rigidly coriaceous, ½-1 in. long, dotted with black glands; *stipules* lanceolate

with a long spur. *Racemes* 1-3 in., laxly 3-12-flowered; *bracts* ovate, acute, almost concealing the yellow flowers, dotted. *Pods* 1-6-jointed, pubescent, densely prickly.

Common in sandy waste places. DISTRIB. Plains from the Himalaya to Ceylon, Burma and the Malay Penins. ascending to 4,000 ft. in Kumaon; everywhere in the tropics.

47. SMITHIA, Ait.; Fl. Brit. Ind. ii, 148.

Herbs or undershrubs. *Leaflets* many, small, opposite, sensitive, leaf-rachis ending in a bristle; *stipules* scariose, with large auricles. *Flowers* racemose or axillary. *Calyx* deeply 2-lipped, the lips usually entire. *Corolla* exserted, *standard* orbicular; *keel* incurved, obtuse. *Stamens* in 2 bundles of 5 each, *anthers* uniform. *Ovary* linear, many-ovuled; *style* incurved, filiform; *stigma* minute, capitate. *Pod* of few or many small flattened or turgid joints, folded together inside the calyx.—Species about 30, found in the tropics of the Eastern Hemisphere

Calyx rigid, lips acute.	
Flowers in short racemes.	1. *S. sensitiva.*
Flowers in pairs, axillary	2. *S. geminiflora.*
Calyx membranous, upper lip truncate.	3. *S. ciliata.*

1. S. sensitiva, *Ait. Hort. Kew. ed. I, iii, 496; Roxb.; Fl. Ind. iii, 342; W. & A. Prod. 220 (in part); Royle Ill. 201; D. & G. Bomb. Fl. 63 (in part); F. B. I. ii, 148; Watt E. D.*

A diffuse spreading annual. *Stems* 1½-3 ft. long, slender, much-branched, glabrous. Leaf-rachis ½-1 in., bristly; *leaflets* 3-10 pairs, ¼-½ in. long, oblong, obtuse, bristly on the almost straight margins and on the midrib beneath. *Flowers* 1-6, in close short-peduncled simple racemes from the axils of the upper leaves; *pedicels* short, ascending, bracteolate. *Calyx* ¼-⅓ in.; lips subequal, acute, entire, with a few scattered pale-yellow bristles *Corolla* ⅔ in. long, yellow. *Pod* 4-6 jointed, faces densely papillose.

Dehra Dun and Siwalik range. DISTRIB. Outer W. Himalaya to the Khasia Hills and south to Ceylon, Burma, Andaman and Nicobar Islands; also in Abyssinia, Madagascar, Java and China. The leaves are eaten as a potherb, and the plant affords excellent fodder for cattle.

2. S. geminiflora, *Roth Nov. sp. 352; F. B. I. ii, 149.* S. sensitiva, *Wall.; W. & A. Prod. 220 (in part).*

Very similar to the preceding, but with fewer leaflets and the bristles on the edges and midrib are more copious and longer. *Flowers* in pairs in the axils of the leaves.

Dehra Dun (Duthie). DISTRIB. Himalaya, up to 3,000 ft., and south to Ceylon; also in Burma, Java and in N. Australia.

VAR. conferta, *F. B. I. l. c.* S. conferta, Sm.—Upper nodes congested into dense heads, leaves and calyx more bristly.—Lalitpur in Bundelkhand (Duthie). DISTRIB. Mt. Abu, Chánda dist. in the C. Prov.

3. S. **ciliata,** *Royle Ill. 201, t. 35, f. 2; F. B. I. ii, 150.* S. pumila, *Royle MSS.; W. & A. Prod. 220.*

An annual with slender glabrous stems, ½-2 ft. high. Leaf-rachis ½-1 in.; *leaflets* 3-8 pairs, ¼-⅜ in., linear, obtuse, distinctly bristly on the edges and midrib below. *Flowers* in dense copious short-peduncled axillary secund racemes; *bracteoles* leafy, oblong, ciliated, nearly as long as the calyx. *Calyx* ¼ in., densely bristly; upper lip truncate, finally ½ in. broad, lower one lanceolate. *Corolla* yellow, little exserted.

Dehra Dun. DISTRIB. Himalaya from Simla to Sikkim and the Khasia and Naga Hills, up to 6,000 ft., Parasnath, Burma; also in Formosa.

48. ÆSCHYNOMENE, Linn.; Fl. Brit. Ind. ii, 151.

Erect herbs or undershrubs. *Leaves* with very numerous close sensitive odd-pinnate small linear leaflets. *Flowers* in sparse racemes. *Calyx* deeply 2-lipped, the lips faintly toothed. *Corolla* fugacious, *standard* orbicular, *keel* not beaked. *Stamens* in 2 bundles of 5 each, *anthers* uniform. *Ovary* stalked, linear, many-ovuled; *style* filiform, incurved, *stigma* terminal. *Pod* linear, exserted, with a stalk longer than the calyx, and 4-8 flattened 1-seeded separating joints.—Species upwards of 50, inhabiting the tropical regions of both hemispheres.

Stems slender, much branched; calyx glabrous	1. *Æ. indica.*
Stems robust, pith-like; calyx hispid. .	2. *Æ. aspera.*

1. **Æ. indica,** *Linn.; Sp. Pl. 713; W. & A. Prod. 219; D. & G. Bomb. Fl. 62; F. B. I. ii, 151; Watt E. D.* Hedysarum Neli-Tali, *Roxb.; Fl. Ind. iii, 365.* Smithia aspera, *Roxb. l.c. 343.*—Vern. *Kath-sola* (Beng.)

A shrub-like annual, 1-3 ft. high, glabrous, pale-green, with many slender terete branches, often slightly muricate. *Leaf-rachis* 2-3 in. long; *stipules* linear-lanceolate, acuminate, with acute auricled bases, deciduous; *leaflets* very numerous, small, sessile, alternate, set obliquely on the rachis and overlapping, linear, obtuse, apiculate, thin, glabrous, 1-nerved, the upper ones much the smallest. *Flowers* 1-4, in axillary racemes; *peduncles* and *pedicels* slender, glandular and usually viscid; *bracts* small lanceolate, ciliate. *Calyx* ¼ in., glabrous, the lips shortly toothed. *Corolla* twice the calyx, yellow, the *standard* veined with purple. *Pod* 1-1½ in. long, straight or slightly curved; upper sutur

straight, lower more or less indented; joints 6-10, smooth or finally papillose, readily separating.

Common within the area. DISTRIB. W. Himalaya from Kashmir to Kumaon, up to 5,000 ft., and throughout the plains of India to Ceylon; also in the Andaman Islands, Siam and Japan, and generally in the tropics of the Old World. Flowers during the rainy season. The base of the stems is sometimes swollen, but not to the same extent as in the next species.

2. **Æ. aspera,** *Linn. Sp. Pl. 713; W. & A. Prod. 219; Royle. Ill. 191; F. B. I. ii, 152; Watt E. D.* Hedysarum lagenarium, *Roxb; Fl. Ind. iii, 365.*—Vern. *Sola.*

A tall erect shrub-like aquatic perennial. *Stems* very stout, pith-like, usually unbranched, often horizontal below when floating, glabrous. *Leaves* large, shortly stalked or sessile; rachis 3-6 in. long; *stipules* ½ in. or more, linear, acuminate, with a rounded ciliated auricle at the base, deciduous; *leaflets* as in *Æ. indica*, but more numerous and twice as large. *Flowers* rather large, 2-4, arranged in axillary corymbose racemes which are much shorter than the leaves; *peduncles* and *pedicels* bristly; *bracts* and *bracteoles* ovate, acute *Calyx* ⅝ in., hispid, upper lip rounded. *Corolla* twice the calyx, yellow, fugacious; keel petals hairy outside. *Pod* 2-3 in. long, broader than in *Æ. indica*, woody, nearly straight; joints 3-8, indented on both surfaces or on the lower one only, distinctly echinate on the faces when mature.

Pathri forest in the Saharanpur dist. (Kanjilal). DISTRIB. In swamps throughout India, except in the dry North-West: Ceylon, Malay Penins. and Islands and in Trop. Africa. Flowers during the rains. The soft pith-like wood is largely used by fishermen for floats, and from slices of the stem the well-known pith-hats (*sola-topis*) are made.

49. LESPEDEZA, Mich.; Fl. Brit. Ind. ii, 142.

Herbs or undershrubs. *Leaves* 3-foliolate, exstipellate. *Flowers* copious, in racemes, or crowded in the leaf-axils. *Calyx* campanulate, teeth lanceolate or linear. *Corolla* exserted, *standard* broad, *keel* obtuse or acute. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* sessile or stalked, 1-ovulate; *style* long, filiform, incurved; *stigma* minute, terminal. *Pod* small, oblong, compressed, 1-seeded, reticulate-veined, indehiscent.—Species about 33, in the Temp. and Trop. regions of both hemispheres.

Leaflets linear-cuneate, flowers fascicled, keel obtuse	1. *L. sericea.*
Leaflets obovate-cuneate, flowers in racemes; keel acute, much incurved	2. *L. stenocarpa.*

1. L. sericea, *Miq. Ann. Mus. Bot. Lugd. Bat. iii, 49; F. B. I. ii, 142.*

An erect undershrub, 2-4ft. high, with long, slender tough branches. *Leaves* ascending, crowded; *petioles* short; *leaflets* ¼-½ in. long, linear-cuneate, emarginate, rigidly coriaceous, very shortly stalked, usually glabrous above, clothed beneath with appressed grey or white silky hairs. *Flowers* 2-4, on short pedicels in the leaf-axils; bracteoles minute. *Calyx* with long linear-subulate teeth. *Corolla* twice the calyx, white tipped with purple; *keel* obtuse, much incurved. *Pod* ½ in., sessile, thinly silky; *style* persistent, twice as long as the pod.

Dehra Dun (Gamble), Rohilkhand (T. Thomson). DISTRIB. Himalaya from Hazára to Assam, up to 5,000ft.; Mt. Abu in Rajputána, Behar, C. India, Upper Burma; also in China, Japan and N. Australia. Flowers during the hot season.

2, L. stenocarpa, *Maxim. Syn. Lesped. 23; Prain in Journ. As. Soc. Beng. LXVI, part ii, 376.* L. sericea, *Royle Mss. (not of Miq.).* L. Royleana, *Miq.* L. macrostyla, *F. B. I. ii, 143 (in part).*

An undershrub, with long virgate densely white-pubescent branches. *Petioles* about ½ in. long; *leaflets* ½-⅝ in. long, obovate-cuneate, emarginate and often mucronate, rigidly coriaceous, densely white-tomentose beneath. *Racemes* short, densely silky; *bracts* ovate, silky, concealing the buds. *Calyx*-teeth longer than the tube. *Corolla* about ½ in. long, reddish-purple. *Pod* grey-silky, narrowly oblong, gradually tapering upwards to the base of the persistent plumose style.

Siwalik range, common on cliffs and steep banks. DISTRIB. Outer ranges of the W. Himalaya, from Simla to Kumaon. Flowers during the latter part of the rainy season.

50. ELEIOTIS, DC.; Fl. Brit. Ind. ii, 153.

A procumbent herb with usually 1-foliolate stipellate leaves. *Flowers* in axillary racemes. *Calyx* with very short tube and 5 subequal setaceous teeth. *Corolla* minute, *standard* broad; *keel* obtuse, adhering to the wings. *Stamens* 1-adelphous, *anthers* uniform. *Ovary* subsessile, 1-ovuled; *style* short, uncinate or nearly straight, thickened at the base, *stigma* capitate. *Pod* of a simple dimidiate membranous veined joint, with a flattened straight dorsal and a rounded ventral suture.—A single species, confined to India and Ceylon.

E. sororia, *DC. Mém. Leg. vii, 350; W. & A. Prod. 231; F. B. I. ii, 153.* Hedysarum sororium, *Linn.; Roxb. Fl. Ind. iii, 352.*

Stem hardly any; branches very long, slender, trailing, 3-sided, glabrous. *Leaves* subglabrous, membranous, consisting usually of a single short stalked stipellate terminal leaflet, rounded or broader than long.

emarginate, often clouded, ½-1 in. long, but occasionally with a pair of minute lateral leaflets; *stipules* semi-lanceolate, chaff-like. *Racemes* few-flowered, longer than the leaves; *pedicels* spreading, downy, exceeding the calyx; *bracts* minute, ovate, scariose, deciduous. *Pod* ½ in. long, acute, glabrous.

Bundelkhand, in rocky ground (Edgeworth). DISTRIB. Behar, S. India and in Ceylon. Very similar in foliage and habit to *Desmodium reniforme, DC.*

51. URARIA, Desv.; Fl. Brit. Ind. ii, 155.

Suffruticose perennials. *Leaflets* 1-9, stipellate. *Flowers* very numerous, minute, racemose. *Calyx-tube* very short, 2 upper teeth short; 3 lower usually elongated, setaceous. *Standard* broad, *wings* adhering to the obtuse keel. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* sessile or shortly stalked, few-ovuled; *style* inflexed, filiform, *stigma* terminal. *Pod* of 2-6 small turgid 1-seeded indehiscent joints often placed face to face.—Species 15, in S. E. Asia and Australia.

I have adopted Dr. Prain's conclusions, published in Journ. As. Soc. Beng., Vol. LXVI, part 2 (1897), in regard to the limitations and synonymy of the species of this puzzling genus.

Upper leaves 5-9-foliolate	*1. U. picta.*
Leaves 1- and 3-foliolate.	
Lower teeth of calyx elongated.	
Pod glabrous	*2. U. alopecuroides.*
Pod hairy	*3. U. lagopus.*
Calyx-teeth sub-equal.	
Pod glabrous	*4. U. neglecta.*
Pod hairy	*5. U. hamosa.*
Leaves all 1-foliolate	*6. U. prunellæfolia.*

1. U. picta, *Desv. Journ. Bot. i (1833), 123, t. 5, f. 19; W. & A. Prod. 221; Royle Ill. 191; D. & G. Bomb. Fl. 65; F. B. I. ii, 155; Watt E. D.* Doodia picta, *Roxb. Fl. Ind. iii, 368.*

An erect shrubby perennial, about 3 ft. high. *Stem* robust, finely downy, branches few. *Leaves* 10-12 in. long; lowest simple or 3-foliolate, rounded or oblong; upper 5-9-foliolate, on a downy rachis; *petiole* 1-2 in.; *stipules* ½ in. long, lanceolate, acuminate; *leaflets* 1-8 in. long, linear-lanceolate, rigidly coriaceous, glabrous and clouded with white above, reticulate-veined and minutely pubescent beneath; *stipels* subulate. *Racemes* in dense cylindrical heads, 6-12 in. long; *bracts* brown, scarious, deciduous; *pedicels* abruptly incurved at the tip after flowering, bristly. *Calyx* ⅛ in. long. *Corolla* exserted, purple. *Pod* glabrous, pale lead-coloured or whitish, 3-6-jointed.

Common in most parts of the area, especially in the Sub-Himalayan tracts. DISTRIB. Himalaya up to 6,000 ft. and south to Ceylon; Malay Penins.

and Islands, Trop. Africa and the Philippines. The plant is used medicinally in some parts of India.

2. U. alopecuroides, *Wight Ic. 290; Prain in Journ. As. Soc. Beng. l.c. 381.* U. repanda, *Wall. Cat. 5677; F. B. I. ii, 156.* Doodia alopecuroides, *Roxb. Fl. Ind. iii, 368.*

An erect undershrub, with many spreading branches clothed with small, hooked bristles. *Leaves* 1- and 3-foliolate; *stipules* tapering from a broad ciliate base; *leaflets* 2-4 in. long, ovate or oval, rounded or cordate at the base, clouded, both surfaces bristly-pubescent. *Stipels* setaceous. *Racemes* terminal and axillary, strobiliform and at length cylindrical; *pedicels* becoming incurved at their tips; *bracts* round-cordate, cuspidate, densely ciliate, closely imbricate before the flowers expand. *Calyx* ¼ in.; teeth plumose, lower filiform, the two upper ones very short. *Corolla* pink. *Pods* 2-jointed, glabrous.

Dehra Dun (Vicary), Bahraich in N. Oudh (Duthie's collector). DISTRIB. Cent. Prov. (Duthie), Chota Nagpur, Khasia Hills, Burma.

3. U. lagopus, *DC. in Ann. Sc. Nat. Sér. I, iv (1825), 100; F. B. I. ii, 156 (in part); Prain in Journ. As. Soc. Beng. l.c. 381.* U. lagopoides, *Wall. (not DC.).*

An erect undershrub. *Stem, petioles* and *rachis* of inflorescense densely pubescent and bristly. *Leaves* 1- and 3-foliolate; *petiole* 2-3 in.; *stipules* lanceolate-acuminate from a broadly cordate base; *leaflets* 2½-4½ in. long, ovate or oval, obtuse or emarginate, mucronate, coriaceous, scabrous above, paler and tomentose beneath, and distinctly reticulate-veined. *Racemes* cylindrical, mostly terminal, up to 1 ft. in length, often panicled; *pedicels* becoming incurved at their tips; bracts deciduous, ovate-acuminate, densely ciliate. *Calyx* very hairy; teeth plumose, the lower ones elongated. *Corolla* purple. *Pod* hairy, 2-6-jointed.

Dehra Dun (Gamble). *Distrib.* Outer Himalayan ranges from the Punjab to Sikkim and Assam.

4. U. neglecta, *Prain in Journ. As. Soc. Beng. LXVI, part 2 (1897), 382.* U. lagopoides, *Royle Ill. t. 33, f. 1.* U. lagopus, *Royle Ill. 201; F. B. I. ii, 156 in part, (not of DC.).*

An erect undershrub with slender shortly pubescent woody branches. *Leaves* as in *U. hamosa; stipules* lanceolate-acuminate; *leaflets* large, oblong, not cordate. *Racemes* long, dense, cylindrical; *bracts* ovate-cuspidate. *Calyx-teeth* subequal. *Pod* glabrous.

Dehra Dun (Vicary, King, Gamble), Siwalik range (Royle). DISTRIB. Punjab Himalaya west to Kumaon; Bengal, Assam, Mishmi. This plant, which is common on the outer Himalayan ranges, stands intermediate between *U. lagopus* and *U. hamosa*, having the inflorescence of the former and the bracts and foliage of the latter; it differs from both, however, in its glabrous pods.

5. U. hamosa, *Wall. Cat. 5681 B; W. & A. Prod. 222; F. B. I. ii, 156; Prain in Journ. As. Soc. Beng. l.c. 382.* Doodia hamosa, *Roxb. Fl. Ind. iii, 367.* D. simplicifolia, *Roxb. l.c. 366.*

A straggling diffuse undershrub. Young parts clothed with long hairs and shorter hooked bristles. *Leaves* 1- and 3-foliolate; *stipules* acuminate from a broad semicordate base, hairy; *leaflets* 3-5 in. long, round or obovate, obtuse or emarginate, rarely acute, rounded not cordate at the base, glabrous above, downy beneath; *stipels* minute, setaceous. *Racemes* cylindrical, lax, copiously panicled and elongating in fruit; *bracts* imbricating in bud, ovate-cuspidate, hairy, deciduous; *pedicels* ⅓-½ in., incurved at the apex, often fascicled. *Calyx* ⅓ in., teeth subequal, deltoid-cuspidate. *Pod* hairy, 2-6-jointed.

Dehra Dun. DISTRIB. Eastward to Bengal, Sikkim and Burma, and South to Ceylon; also in the Malay Islands.

6. **U. prunellæfolia,** *R. Grah. in Wall. Cat. 5686; F. B. I. ii, 157; Duthie & Prain in Ann. R. Bot. Gard. Calc. IX, 25, t. 33.*

A small undershrub with a much reduced woody stem. *Branches* 8-16 in. high, erect, herbaceous, sparsely pubescent. *Leaves* 1-foliolate; *petiole* ½-¾ in.; *stipules* linear-lanceolate, erect; *leaflet* 2½-4½ in. long, oblong or lanceolate, obtuse or acute, rounded or truncate at the base, hirsute on the veins and nerves, especially beneath. *Racemes* about 2 in. long, terminal, simple. *Flowers* in fascicles; *pedicels* ½-¾ in., slender, bristly; *bracts* lanceolate, deciduous. *Calyx* ⅛ in., bristly, tube campanulate; teeth lanceolate, lower twice as long as the upper. *Corolla* bluish, twice the calyx. *Pod* 5-6-jointed, spiral or hamate, not folded within the calyx; *joints* black, sparsely puberulous.

Rohilkhand, N. Oudh and Gorakhpur (Duthie's collectors). DISTRIB Kumaon at 3,000 ft. (T. Thomson), Eastern Himalaya up to 3,500 ft. Flowers in April and May. This plant has all the appearance of having become dwarfed by periodical forest fires.

52. LOUREA, Neck.; Fl. Brit. Ind. ii, 154.

Herbs. *Leaves* membranous, stipellate, 1-3-foliolate. *Flowers* in terminal simple or panicled racemes. *Calyx* membranous, accrescent, the lanceolate teeth as long as the campanulate tube. *Corolla* equalling or exceeding the calyx, *standard* broad, *keel* obtuse. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* few-ovuled; *style* filiform, inflexed, *stigma* capitate. *Pod* of about 4 small distinct 1-seeded smooth veined joints, included in the calyx.—Species 4, inhabiting Trop. Asia and Australia.

1. Vespertilionis, *Desv. Journ. Bot. i (1813), 122, t. 5, f. 18; W. & A. Prod. 221; F. B. I. ii, 154.* Hedysarum Vespertilionis, *Roxb.; Fl. Ind. iii, 352.*

An erect slender herb with finely downy stems. *Leaves* 1- rarely 3-foliolate, rachis ½-1 in.; terminal leaflet 2-3 in. broad and ½-¾ in. long, with 2 linear spreading or slightly ascending 2-3-nerved halves, apex of each lobe broadly emarginate and bristle-tipped; side leaflets if present much smaller, obliquely obversely deltoid. *Racemes* simple or slightly panicled, 3-6 in. long; *pedicels* pubescent, shorter than the calyx, the

lower ones geminate *Calyx* finally ¼-¾ in., membranous, reticulate-veined, teeth as long as the tube. *Corolla* not longer than the calyx. *Pod* 4-5-jointed.

Merwara. DISTRIB. Central and South India, and in the tropics of both Hemispheres, but often planted.

53. ALYSICARPUS, Neck.; Fl. Brit. Ind. ii, 157.

Diffuse annuals or biennials. *Leaves* simple or rarely 3-foliolate stipellate, subcoriaceous. *Flowers* in leaf-opposed or terminal racemes or spikes. *Calyx* glumaceous; teeth deep, often imbricated, the 2 upper often connate. *Corolla* not exserted, *standard* broad; *keel* obtuse, adhering to the wings. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* nearly or quite sessile, many-ovuled, *style* incurved, *stigma* capitate. *Pod* terete or turgid, composed of several indehiscent 1-seeded joints.—Species about 15, dispersed throughout the tropics of the Old World.

Calyx shorter or scarcely longer than the first joint of pod.
- Pod moniliform . . . . . *1. A. monilifer.*
- Pod not moniliform.
  - Calyx much shorter than first joint of pod . *2. A. hamosus.*
  - Calyx as long as first joint of pod . . *3. A. vaginalis.*

Calyx much longer than first joint of pod.
- Joints of pod not veined or rugose . . *4. A. bupleurifolius.*
- Joints of pod finely reticulate-veined . *5. A. longifolius.*
- Joints of pod transversely and deeply plicate.
  - Pod included or slightly exserted, not 4-gonous . . . . . *6. A. rugosus.*
  - Pod exserted, 4-gonous . . . . *7. A. tetragonolobus.*

1. **A. monilifer,** DC. *Prod. ii, 353; W. & A. Prod. 232; F. B. I. ii, 157.* Hedysarum moniliferum, *Linn.; Roxb. Fl. Ind. iii, 345.*

Perennial. *Stems* densely tufted, clothed with spreading deciduous hairs. *Leaves* all simple, ½-1½ in. long, oblong, obtuse, often cordate, glabrous; *petiole* about ⅓ as long, finely downy. *Flowers* shortly stalked, about 4-10, in close erect pedunculate racemes. *Calyx* with scattered hairs, about as long as lowest joint of pod; teeth very narrow, rigid. *Pod* ½-¾ in. long, distinctly moniliform, 2-6-jointed, densely clothed with hooked hairs, not reticulate-veined.

Common within the area. DISTRIB. Throughout India to Ceylon and Burma, extending to Nubia and Abyssinia.

2. **A. hamosus,** *Edgew. in Journ. As. Soc. Beng. xxi (1853), 171; F. B. I. ii, 157; Prain in Journ. As. Soc. Beng. lxvi (1897), 384.* Hedysarum procumbens, *Roxb.; Fl. Ind. iii, 345.*

A densely hairy much-branched perennial herb. *Leaves* all simple, ½-1½ in. long and broad, orbicular, obtuse, cordate; *petiole* ½-¼ in. *Racemes* shortly pedunculed, 2-6-flowered; *pedicels* equalling the calyx. *Calyx* much shorter than lowest joint of pod, teeth linear. *Corolla* bluish. *Pod* about ½ in. long, 2-5-jointed, compressed, reticulate-veined, not moniliform, pubescent.

Bundelkhand (Edgeworth), Guna (King). DISTRIB. Punjab, Sind, Behar, Central Provinces and in W. and S. India. Habit of *Desmodium*.

3. **A. vaginalis,** *DC. Prod. ii, 353; W. & A. Prod. 233; D. & G. Bomb. Fl. 64; F. B I. ii, 158; Prain in Journ. As. Soc. Beng. LXVI, part ii, 132.* Hedysarum vaginale, *Linn.; Roxb. Fl. Ind. iii, 345.*

A robust shrub. *Stems* 1-3 ft. ascending, branchlets slightly downy. *Leaves* always 1-foliolate, *petiole* $\frac{3}{10}$ in., slender, glabrous; *stipules* ovate, acute, half as long as the petioles, subscarious, parallel-veined: *leaflets* glabrous, usually cordate at the base, but very variable both as to size and shape even on the same plant, the lower often lanceolate and the upper oblong, or the lower oblong and the upper ovate. *Racemes* 1-3 in. long, laxly 8-12-flowered; *pedicels* shorter than the calyx. *Calyx* about as long as the first joint of pod; teeth linear-setaceous, longer than the tube. *Corolla* small, included, yellow tinged with pink. *Pod* ½-¾ in., terete, reticulate-veined; joints 6-8, longer than broad, slightly thickened at each end, faintly pubescent.

Abundant within the area. DISTRIB. W. Himalaya up to 4,000 ft., and throughout India from the Punjab Plain to Ceylon, and in the Malay Penins.; also in Afghanistan and throughout the tropics of the Old World.

VAR. nummularifolia. *Miq.; F. B. I. l.c.; Watt E. D.; Prain in Journ. As. Soc. Beng. l.c.* A. nummularifolius, *DC. (sp.); W. & A. Prod. 232; D. & G. Bomb. Fl. 64. Stems* slender, diffusely spreading. Lower *leaves* always oblong, upper ovate. *Racemes* lax.—As common and widely distributed as the type.

4. **A bupleurifolius,** *DC. Prod. ii, 352; W. & A. Prod. 233; D. & G. Bomb. Fl. 64; F. B. I. ii, 158.* Hedysarum bupleurifolium, *Linn.; Roxb.; Fl. Ind. iii, 346.* H. gramineum, *Retz.; Roxb. l.c.*

A diffuse herb, or at times suffruticose with ascending stiff glabrous stems 1-2 ft. long. *Leaves* 1-foliolate, shortly stalked, glabrous; *stipules* small, subulate, chaff-like; *leaflet* 1-3 in., linear lanceolate or oblong, acute, glabrous. *Flowers* shortly pedicelled, usually in pairs on rigid spike-like lax racemes. *Calyx* ¼ in., much longer than the lowest joint of the pod; teeth imbricate, ciliate, twice as long as the funnel-shaped tube. *Corolla* pink. *Pod* about ½ in., stalked, cylindric, glabrous; *joints* 4-6, as broad as long, neither veined nor rugose.

Abundant within the area. DISTRIB. Throughout India and in Ceylon, ascending to 4,000 ft. on the Himalaya; also in the Malay Islands, China, Philippines, Mauritius and Polynesia.

VAR. gracilis, *F. B. I. l.c.* A. gracilis, *Edgew. in Journ. Linn. Soc. ix 312 (sp.); Cat. Pl. Banda 46. Leaves* 1-2 in. long, oblong-lanceolate

obtuse. *Calyx* not more than ¼ in. *Pod* 1-2-jointed, included or slightly exserted.—Bundelkhand (Edgeworth). DISTRIB. Southern India (Wight).

5. A. longifolius, *W. & A. Prod. 233; D. & G. Bomb. Fl. 65; F. B. I. ii, 159.*

Stems 4-5 ft., stout, ascending, glabrous. *Leaves* 1-foliolate, shortly petioled, 2-6 in. long, oblong or lanceolate, subcordate, mucronate, hairy on the veins beneath; *stipules* large, lanceolate, acuminate, scarious. *Flowers* in long densely spicate racemes, appressed to the finely hairy rachis. *Bracts* large, broadly ovate, cuspidate, concealing the buds, soon falling. *Calyx* ⅜-½ in. long, much longer than the lowest joint of pod, pubescent; teeth ciliate, much longer than the funnel-shaped plicate tube. *Pod* ⅜-½ in., shortly stalked, apiculate, moniliform; *joints* 4-6, glabrous, faintly reticulate.

Dehra Dun, N. Oudh, Bundelkhand. DISTRIB. Throughout the plains of India, and in Ceylon.

6. A. rugosus, *DC. Prod. ii, 353; F. B. I. ii, 159; Prain in Journ. As. Soc. Beng. LXVI, part ii, 384.* A. Wallichii, *W. & A. Prod. 234.*

Stems 1-2 ft., ascending, nearly glabrous. *Leaves* 1-foliolate, 1-3 in. long, on short hairy petioles, usually oblong, with a subcordate base, obtuse, apiculate, glabrous above, slightly bristly beneath and reticulate-veined; *stipules* longer than the petioles, linear-lanceolate, acute, scarious, glabrous. *Flowers* nearly sessile, in dense spike-like racemes 1-4 in. long, appressed to the subglabrous rachis; *bracts* large, chaff-like, ovate-acuminate. *Calyx* ¼-⅜ in., glabrous on the back; teeth imbricate, lanceolate, ciliate. *Pod* included in the calyx, shortly stalked, turgid, apiculate, moniliform; *joints* 2-5, broader than long, prominently marked with transverse ribs.

Dehra Dun, Rohilkhand, Bundelkhand, Merwara. DISTRIB. Himalaya up to 4,000 ft., and south to Ceylon, also in Burma; tropical regions of the Old Word, also at the Cape and in the W. Indies.

VAR. 1. Heyneanus, *F. B. I. l.c.* A. Heyneanus, *W. & A. Prod. 234.* Hedysarum styracifolium, *Roxb.; Fl. Ind. iii, 347.* A. obovatus, *Edgew. Cat. Banda, Pl. 45.*—More robust. *Stems* and *leaves* beneath permanently pubescent; *leaflets* large, obovate-oblong. *Racemes* longer, often 4-6 in., and more lax. *Calyx* shorter, ciliate on the edges only. *Standard* flesh-coloured, wings and keel purple. *Pod* ½ in. broad, often exserted. —Bundelkhand, and Merwara. DISTRIB. Bengal, C. Prov., W. & S. India and Ceylon. Edgeworth states that the flowers close before 3 P.M.

VAR. 2. styracifolius, *F. B. I. l.c. (excl. A. pilifer, Wall.); Prain in Journ. As. Soc. Beng. l.c.* A. styracifolius, *DC. (excl. syn.); W. & A. Prod 234; D. & G. Bomb. Fl. 65.* Hedysarum glumaceum, *Kœn. in Roxb. Fl. Ind. iii., 347.*—A smaller plant with diffuse finely pubescent stems. *Leaflets*, small, oblong, obtuse, pubescent beneath. *Racemes* short, dense. *Calyx* ¼ in., hairy and with distinctly ciliate edges. *Pod* ⅛ in. broad,

rarely exserted.—Agra Dist. (Munro), Bundelkhand. DISTRIB. Throughout India, also in Ceylon and Burma.

VAR. 3. ludens, *F. B. I. l.c.* A. ludens, *Wall. Cat. 5762 B. & F.*—*Leaves* 2-3 in. long, linear, distant. *Racemes* about 6 in., the lower flowers lax. *Calyx* ½ in., hairy, not much ciliated.—Etawah dist., Merwara (Duthie). DISTRIB. Plains of Bengal. This variety has the habit of *A. bupleurifolius*.

VAR. 4. minor, *Prain in Journ. As. Soc. Beng. l.c.*—Dwarf, diffuse, with the stems and leaves beneath glabrous. *Leaflets* small, oblong, ovate or orbicular, obtuse or subacute. *Racemes* short, dense; *bracts* and *calyx* glabrous.—Dehra Dun (Duthie). DISTRIB. W. Himalaya (Griffith), Plains of Punjab and Rajputana, W. & S. India, Bengal, Assam and Shan States. This variety combines the habit of VAR. *styracifolius* with the glabrous leaves and stems and the inflorescence of typical *A. rugosus* (Prain l.c.).

7. A. tetragonolobus, *Edgew. in Journ. As. Soc. Beng. xxvi (1853), 169; Cat. Banda Pl. 45.*

A procumbent herb with many slender stems 6-12 in. long, branching from the base and with the hairs in lines. *Leaves* 1-foliolate, shortly petioled; *leaflets* 1-1½ in. long, oblong or lanceolate, obtuse or subacute, hairy on the nerves beneath. *Racemes* lax, 2-3 in. long, the lower flowers in distant pairs; *pedicels*, short. *Calyx* ⅛-⅓ in., deeply divided, teeth lanceolate, acuminate, ciliate. *Pod* ¾-1½ in., distinctly exserted, quadrangular, moniliform; *joints* 2-6, transversely and deeply plicate, glabrous.

Jumna ravines near Etawah, and in Bundelkhand. DISTRIB. Cent. and W. India. Very like a small form of *A. rugosus*, but easily distinguished by its quadrangular pods.

54. ALHAGI, Desv.; Fl. Brit, Ind. ii, 145.

Small spinous shrubs. *Leaves* simple. *Flowers* axillary. *Calyx* campanulate; teeth minute, distinct, acute. *Corolla* exserted, *standard* broad, *keel* obtuse. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* linear, sessile, 6-8-ovuled, glabrous or silky; *style* filiform, incurved; *stigma* minute, capitate. *Pod* linear, subcontinuous or moniliform; *joints* oblong, small, turgid, smooth.—Species 2, in S. E. Europe and N. Africa to N. W. India.

A. camelorum. *Fisch. Ind. Hort. Gorenk. ed. ii, 72; Prain in Journ. As. Soc. Beng. LXVI (1897), 377.* A. maurorum, *W. & A. Prod. 232; (not of Tournef.); Royle Ill. 194; D. & G. Bomb. Fl. 67; Brand. For. Fl. 144; F. B. I. ii 145; Watt E. D.* Hedysarum Alhagi, *Linn. (in part); Roxb. Fl. Ind. iii, 344.*—Vern. *Jawása.* (Camel-thorn.)

A small erect spinous shrub with terete nearly glabrous branches; *spines* axillary, an inch or more long. *Leaves* simple, ½-¾ in. long, obovate-oblong, obtuse, mucronate, cuneate, coriaceous, glabrous or slightly

pubescent; *stipules* minute, subulate. *Flowers* 1-6, on the spines, shortly stalked. *Calyx* glabrous, longer than the pedicels; teeth short, triangular, acute. *Corolla* three times the calyx, reddish, glabrous. *Pod* about 1 in. long, usually falcate, irregularly constricted between the seeds, smooth.

Not uncommon within the area, on sandy or rocky ground. DISTRIB. Plains of Punjab and Sind, Salt Range, Rajputana, Gujarat; and in the drier parts of Kashmir, also in Baluchistan, and in Egypt and Arabia. Flowers in March and April. The plant is given as fodder to camels; it has also well-known medicinal properties; the twigs are much used for making *tatties*. A form with much broader leaves is found in Rajputana. The true *A. maurorum* of Tournefort with silky pods does not occur in India. The manna, or sugary excretion, produced on this plant, and sold in the Indian bazars under the name '*taranjabin*,' is imported from Persia and Bokhara.

55. OUGEINIA, Benth; Fl. Brit. Ind. ii, 160.

A tree, with pinnately 3-foliolate leaves. *Flowers* in fascicled axillary racemes from the old wood. *Calyx-tube* campanulate; teeth small, the 2 upper subconnate. *Corolla* much exserted, *standard* broad, *keel* obtuse. *Stamens* 2-adelphous, *anthers* uniform. *Ovary* sessile, linear, many-ovuled; *style* filiform, incurved; *stigma* minute, capitate. *Pod* linear, flat, smooth, formed of 2-5 large more or less distinct joints.—A single species, confined to India.

O. dalbergioides, *Benth. in Miq. Pl. Jungh. 216; Brand. For. Fl. 146, t. 23; F. B. I. ii, 161; Watt E. D.* Dalbergia ougeinensis, *Roxb.; Fl. Ind. iii, 220; Royle Ill. 191.*—Vern. *Sándan, pánan* (Oudh).

A medium-sized tree, with a short often crooked trunk; *bark* thin, grey. *Petioles* 1½-2 in.; *stipules* lanceolate, acute, soon falling; *leaflets* rigidly coriaceous, glabrous or downy beneath; terminal leaflet 3-6 in. long, roundish or obovate, entire or obscurely crenate; lateral smaller, opposite, oblique; *stipels* minute, subulate. *Flowers* many, in short fascicled racemes from the nodes of old branches; *pedicels* ½-¾ in., filiform; *bracts* small, ovate-acuminate, villous. *Calyx* ⅛-⅓ in., pubescent, teeth obtuse. *Corolla* lilac or whitish. *Pod* 2-4 in. long, flat; *joints* 2-3 times as long as broad.

Forests of Dehra Dun and Siwalik range, Oudh, Bundelkhand. DISTRIB. Sub-Himalayan tract, from the Sutlej to Sikkim, ascending to 4,000 ft., and from Chota Nagpur south to the Godáveri and N. Kanara. The flowers appear in March after the old leaves have fallen and just as the new foliage is coming out. The bark exudes an astringent gum, which is used medicinally as well as for poisoning fish. The reddish heartwood is strong and tough and is much valued. The tree is extensively lopped for cattle-fodder.

56. DESMODIUM, Desv.; Fl. Brit. Ind. ii, 161.

Herbs or shrubs. *Leaves* 1- or 3-foliolate, stipellate. *Flowers* small, usually in copious often dense racemes. *Calyx* campanulate, teeth longer or shorter than the tube, the 2 upper often sub-connate. *Corolla* exserted. *Standard* broad, *wings* more or less adherent to the usually obtuse keel. Upper *stamen* entirely or partially free from the other united 9. *Ovary* sessile or stipitate, few or many-ovuled, *style* incurved; *stigma* minute, capitate. *Pod* usually composed of several 1-seeded indehiscent joints, the faces compressed, the upper suture rarely finally splitting open, the joints usually separating.—Species about 150, cosmopolitan in trop. and sub-trop. countries, a few in temp. N. America, and a few in temp. S. Africa.

Pods distinctly divided into several separating 1-seeded joints.
- Leaves 3-foliolate.
  - Undershrubs or shrubs.
    - Flowers in dense axillary umbellate heads . . . . . 1. *D. Cephalotes.*
    - Flowers in elongated racemes.
      - Clusters of flowers concealed by large 2-fol. bracts . . 2. *D. pulchellum.*
      - Flowers not concealed.
        - Joints of pod indehiscent.
          - Bracts minute.
            - Leaflets narrow, dark-green and shining above; joints of pod twice as long as broad . . . 3. *D. laburnifolium.*
            - Leaflets broad, joints of pod 3-4 times as long as broad 4. *D. laxiflorum.*
          - Bracts large, closely imbricate in bud . . . 5. *D. concinnum.*
        - Joints of pod dehiscing along the lower suture . . . 6. *D. polycarpum.*
  - Herbaceous.
    - An erect annual with glabrous spirally twisted pods . . 7. *D. spirale.*
    - A diffuse hairy perennial herb, pods clothed with hooked hairs . 8. *D. diffusum.*
    - Trailing herbs.
      - Flowers 1-3 in the leaf axils . 9. *D. triflorum.*
      - Flowers in racemes . . . 10. *D. parvifolium.*

Leaves 1-foliolate.
  Shrubs, pods 4-8-jointed.
    Petioles with broad wings.
      Erect; pods persistently hairy throughout . . . . . *11. D. triquetrum.*
      Diffuse: pods glabrous, except along the sutures . . . *12. D. pseudo-triquetrum.*
    Petioles not winged.
      Leaflets glabrescent on upper surface . . . . . *13. D. gangeticum.*
      Leaflets scabrous on upper surface . . . . . *14. D. latifolium.*
  A trailing herb, pod 2-jointed . *15. D. brachystachyum.*
Pods indistinctly jointed, not separating into segments, but dehiscing all along the ventral suture; leaves 3-fol., the lateral leaflets small or wanting.
  Branches scarcely woody, pods slightly downy . . . . . *16. D. gyrans.*
  Branches distinctly woody, pods tomentose . . . . . *17. D. gyroides.*

1. D Cephalotes, *Wall. Cat. 5721; W. & A. Prod. 224; F. B. I. ii, 162; Watt E. D.* Hedysarum umbellatum, *Roxb. Fl. Ind. iii, 360.*

A shrub, 4-5 ft. high, with 3-angled zigzag silky branches. *Leaves* 3-foliolate; *petiole* 1-2 in., channelled above, silky; *stipules* lanceolate, scarious, bristle-pointed, persistent; *leaflets* oblong or obovate-oblong, usually acute, sub-coriaceous, green and glabrous above, grey-silky and with many conspicuous parallel veins beneath; the end-leaflet 3-6 in. long, lateral smaller; stipels subulate. *Flowers* 20 or more, in dense umbellate heads; *peduncles* stout, silky, ½ the length of the petioles; *pedicels* unequal, clothed with white silky hairs at the apex; *bracts* and *bracteoles* caducous. *Calyx* ¼-⅓ in., silky; teeth lanceolate, as long as the tube. *Corolla* twice the calyx, red. *Pod* less than 1 in., slightly curved, indented on both sutures, silky; *joints* 3-6, as broad as long.

Dehra Dun and Siwalik range, common in sál forests; also in N. Oudh and Sundelkhand. DISTRIB. Eastward to Chittagong, ascending to 4,000 ft., on the Outer Himalaya, and south to Ceylon; also in Burma. Flowers during the rainy season. The pods are said to be poisonous to cattle. Some of the specimens from N. Oudh have the leaflets rounded at the apex.

VAR. congestum, *Prain in Journ. As. Soc. Beng. LXVI, part ii, 389.* D. congestum, *Wall.; W. & A. Prod. 224; D. & G. Bomb. Fl. 66.* Hedysarum Cephalotes, *Roxb. Fl. Ind. iii, 360 (not of Linn.).*—*Branches and*

leaves finally glabrous, or only slightly silky. *Pod* glabrescent.—N. Oudh (R. Thompson). DISTRIB. W. and S. India to Ceylon, Chittagong, Mishmi, Upper and Lower Burma.

2. D. pulchellum, *Benth. ex Baker in F. B. I. ii, 162 ; Brand. For Fl. 145 ; Watt E. D.* Hedysarum pulchellum, *Linn. ; Roxb. Fl. Ind iii, 361.* Dicerma pulchellum. *DC. ; W. & A. Prod. 230 ; Royle. Ill. 191.*

A shrub, 3 to 6 ft. high, with slender terete or ribbed finely grey-downy branches. *Leaves* 3-foliolate ; *petiole* ½ to ¾ in.; *stipules* lanceolate-acuminate ; *leaflets* 3-6 in., oblong-lanceolate or elliptic, obtuse or subacute, rounded at the base, sometimes with slightly repand or undulate margins, coriaceous, glabrous above, finely downy beneath, end-leaflet much the largest. *Flowers* small, arranged in clusters of 2-6 in erect terminal and axillary racemes, each cluster concealed by a pair of orbicular leaf-like bracts placed back to back ; *bracts* ⅜-½ in. across, glabrous above, finely downy beneath. *Calyx* ⅛ in., hairy ; teeth lanceolate, shorter than the tube. *Corolla* three times the calyx, white or tinged with pink. *Pod* ¼-⅜ in., indented on both sutures, completely hidden by the bracts, glabrous or downy ; *joints* usually 2, rather longer than broad, reticulate-veined.

Dehra Dun, Siwalik range, Rohilkhand, Oudh and Gorakhpur, chiefly in sál forests. DISTRIB. Throughout India to Ceylon. Burma and the Malay Penins. Flowers during the rains. The pairs of bracts inclosing the clusters of flowers are supposed to represent the lateral leaflets of the ordinary foliage, the terminal leaflet becoming reduced to a mere bristle at the apex of the rachis.

3. D. laburnifolium, *DC. Prod. ii, 337 ; F. B. I. ii, 163.*

A shrub with slender terete glabrescent branches. *Leaves* 3-foliolate; *petiole* 1-1½ in., thickened, grooved; *stipules* minute, setaceous; *leaflets* 2-4 in., oblong-lanceolate, acute, rigidly subcoriaceous, dark-green glabrous and shining above, hairy on the nerves beneath. *Racemes* 3-6 in.; *pedicels* ¼ in., finally spreading. *Calyx* ⅛ in., appressedly hairy ; teeth lanceolate, as long as the tube, lowest linear. *Corolla* ⅛ to ⅓ in., whitish. *Pod* 2-4 in. long ; *joints* 6-8, twice as long as broad, covered with minute hooked spreading hairs.

Dehra Dun, on the edges of streams. DISTRIB. Himalaya, from Kumaon to Assam and Mishmi, up to 4,000 ft., Ceylon, Upper Burma, Malay Islands, China and Japan. Flowers in July and August.

4. D. laxiflorum, *DC. in Ann. Sc. Nat. Sér. I, iv (1825), 100 ; F. B. I. ii, 164.* D. recurvatum, *Grah. ; W. & A. Prod. 226.* Hedysarum recurvatum, *Roxb. Fl. Ind. iii, 358.* H. diffusum, *Roxb. l.c. 357 (not of Willd.).*

An erect undershrub, 3-5 ft. high, with obtusely angled branches densely clothed at first with short hairs. *Leaves* 3-foliolate; *petiole* 1-2 in.; *stipules* lanceolate-acuminate; *leaflets* 4-6 in., ovate or elliptic, acute, membranous or subcoriaceous, glabrous above, clothed beneath with minute appressed hairs ; *stipels* subulate. *Racemes* copious, axillary and terminal, the latter often compound and up to 1 ft. or more long, slender, drooping;

rachis pubescent. *Flowers* several at each node; *pedicels* ⅛-¼ in., finally spreading; *bracts* minute, deciduous. *Calyx* small, densely hairy, teeth longer than the tube. *Standard* white, *wings* and *keel* tinged with blue. *Pod* 1-1½ in., rarely longer, clothed with minute hooked hairs, slightly constricted at the joints; *joints* 6-10, flattened, 3-4 times as long as broad.

Dehra Dun. DISTRIB. Himalaya, up to 6,000 ft., from Kángra to Assam, Bengal, S. India, Burma; also in Java, Borneo and the Philippines. Flowers in Aug. and Sept.

5. D. concinnum, *DC. in Ann. Sc. Nat. Sér. I, iv (1825), 101; Royle Ill. 194; Brand. For. Fl. 146; F. B. I. ii, 170.*

A tall undershrub, with slender terete drooping branches, densely grey-pubescent when young. *Leaves* 3-foliolate; *petiole* ½ in.; *leaflets* 1½-3 in., oblong, obtuse, subcoriaceous, green, glabrous above, the lower surface conspicuously parallel-veined and clothed with appressed silky hairs. *Racemes* copious, lax, axillary and terminal, usually simple; *bracts* large, ovate, closely imbricated, densely silky. *Calyx-teeth* lanceolate-deltoid. *Corolla* ½-⅔ in., bluish or purple. *Pod* ¾-1 in., shortly stalked, upper suture not indented; *joints* 4-6, indehiscent, minutely downy.

Dehra Dun and Siwalik range. DISTRIB. Outer Himalaya from the Punjab to the Khasia Hills, up to 7,000 ft. at Simla; also in Burma.

6. D. polycarpum, *DC. Prod. ii, 334; W. & A. Prod. 227; D. & G. Bomb. Fl. 66; F. B. I. ii, 171; Watt E. D.* Hedysarum purpureum, *Roxb. Fl. Ind. iii, 358.* H. patens, *Roxb. l. c. 362.*

An erect or subercct undershrub. *Branches* slender, woody, angular, grey-tomentose upwards. *Leaves* 3-foliolate, 2-4 in. long; *petiole* ½-1½ in. long; *stipules* lanceolate; *leaflets* 1½-3 in., obovate-cuneate, rounded or rarely acute at the apex, subcoriaceous, pale-green and often clouded above, clothed beneath with appressed grey hairs, main lateral nerves indistinct; *stipels* subulate. *Flowers* in dense axillary and terminal subsessile racemes; *pedicels* ¼ in., ascending; *bracts* ¼ in., ovate-cuspidate, ciliate. *Calyx* ⅛ in., glabrous; teeth acuminate, exceeding the tube. *Corolla* ¼ in., pale bluish-purple. *Pods* erect, ½-¾ in., slightly indented on the ventral margin, densely ciliate when young, especially on the edges; *joints* 6-8, dehiscing along the lower suture.

Common within the area. DISTRIB. Outer Himalaya, up to 5,000 ft., C. & S. India to Ceylon, Burma, Malay Penins. and Islands; also in China, Japan, the Philippines and in Trop. Africa. Flowers during the rains.

VAR. trichocaulon, *F. B. I. ii, 172.* D. trichocaulon, *DC.*—*Stems* densely clothed throughout with spreading grey hairs, *bracts* larger.—Dehra Dun and Siwalik range. Distribution as of type, ascending to 7,000 ft. on the Kumaon Himalaya.

7. D. spirale, *DC. Prod. ii, 332; F. B. I. ii, 164.*

A cæspitose erect annual, 6-24 in. high, with very slender glabrous stems. *Leaves* 3-foliolate, distinctly petioled; *leaflets* ½-1½ in. long, ovate or

lanceolate, green, membranous, subglabrous. *Racemes* copious, axillary and terminal, the latter much branched; *bracts* minute, setaceous; *pedicels* ¼-½ in., filiform, spreading, glabrous. *Calyx* very small, teeth as long as the tube. *Pod* ⅜-½ in. long, spirally twisted, deeply indented on both sutures; *joints* 4-6, glabrous.

N. W. Prov. (Royle), Bundelkand (Edgeworth). DISTRIB. Africa, Trop. America and Polynesia.

8. D. diffusum, *DC. in Ann. Sc. Nat. Ser. I, iv, 100; W. & A. Prod. 226; F.B.I. ii, 169; Watt E.D.* Hedysarum articulatum and quinquangulatum, *Roxb. Fl. Ind. iii, 355; Royle Ill. 194.*

A diffuse or procumbent herb. *Stems* 1-2 ft. long, stout, angular, clothed with spreading grey hairs. *Leaves* 3-foliolate; *petiole* ½-1½ in., densely hairy; *stipules* large, leafy, amplexicaul and auricled; *leaflets* 1-3 in., ovate oblong or obovate, obtuse, apiculate, rounded or acute at the base, subcoriaceous, rough and reticulate-veined above, finely grey-downy and conspicuously veined beneath; *stipels* rather large, lanceolate. *Racemes* copious, about 1ft. long, axillary and terminal. *Flowers* very small, laxly arranged in fascicles of 2 or 3 on a hairy rachis; *pedicels* slender, hairy; *bracts* minute, lanceolate. *Calyx-teeth* very small, linear, ciliate. *Corolla* twice the calyx, pinkish. *Pod* ½-¾ in., indented on both sutures; *joints* 4-6, about as broad as long, clothed with hooked grey hairs.

Rohilkhand (Duthie's collector) Bundelkhand and on the Malwa plateau up to 4,000 ft. (Edgeworth). DISTRIB. South to Ceylon, and in Burma. The foliage is much eaten by cattle.

9. D. triflorum, *DC. Prod. ii, 334; Royle Ill. 194; D & G. Bomb. Fl. 67; F.B.I. ii, 173; Watt E.D.* D. triflorum var. minus, *W. & A. Prod. 229.* Hedysarum triflorum, *Linn.; Roxb. Fl Ind. iii, 353.*

A small trailing perennial herb, with stems 6-8 in. long; *branches* many, clothed with fine spreading hairs. *Leaves* 3-foliolate, ¼ in. long, *petiole* ¼ in.: *stipules* lanceolate, persistent; *leaflets* ⅛-¼ in., obovate-cuneate, truncate or emarginate, membranous, glabrous above, sparsely appressedly hairy beneath; *stipels* minute, subulate. *Flowers* 1-3 together in the axils of the leaves; *pedicels* about ¼ in. *Calyx* ⅛ in., clothed with long white hairs; teeth long, setaceous. *Corolla* ¼ in., pink or white. *Pod* about ½ in., indented on the lower suture; *joints* 3-5, reticulate-veined, pubescent.

Abundant within the area. DISTRIB. Outer Himalaya, up to 7,000 ft. in Kashmir and 4,000 ft. in Kumaon, and throughout India; cosmopolitan in the tropics. The growth of this plant on pasture-land should be encouraged, as it forms a most excellent turf, and is much liked by cattle. It also stands drought well, and by its habit of growth it acts as a very efficient soil-binder. The fresh leaves are sometimes used for the healing of wounds.

10. D. parvifolium, *DC. in Ann. Sc. Nat. Sér. I, iv (1825), 100; W. & A. Prod. 229; F.B.I. ii, 174; Watt E. D.*

A procumbent wide-trailing herb. *Stems* many, much-branched, pubescent when young. *Leaves* 3-foliolate; *stipules* about as long as the petiole, linear-setaceous, persistent; *leaflets* ½-¾ in., oval or obovate, obtuse or subacute, mucronate, glabrous above, pubescent beneath. *Racemes* usually terminal, exceeding the leaves, laxly 6-8-flowered; *pedicels* filiform; *bracts* lanceolate-cuspidate, loosely imbricate in bud, soon deciduous. *Calyx* ⅛ in., hairy, teeth acuminate. *Corolla* purple. *Pod* about ½ in., both sutures indented; *joints* 3-4, suborbicular, minutely pubescent.

Common within the area. DISTRIB. Outer Himalaya, ascending to 7,000 ft. in Kumaon, and throughout the plains of India to Ceylon and Burma; also in the Malay Islands, China and Japan. Flowers during the rains. The plant is much eaten by cattle.

11. D. triquetrum, *DC. Prod. ii, 326; W. & A. Prod. 224; D. & G. Bomb. Fl. 66; F.B.I. ii, 163 (in part); Prain in Journ. As. Soc. Beng. LXVI, part ii, 143, 390.* Hedysarum alatum, *Roxb.; Fl. Ind. iii, 348.*

An erect shrub, with grooved triangular glabrescent branches. *Leaves* 1-foliolate; *petiole* 1 in., broadly winged; *stipules* ½-⅔ in., closely parallel-veined, persistent; *leaflet* 4-5 in. long, narrowly oblong-lanceolate, acute, base rounded or subcordate, green glabrous and reticulate-veined on both surfaces, main lateral nerves 15-20 pairs; *stipels* small, adnate to upper margin of the petiolar wing. *Inflorescence* of narrow axillary and terminal racemes 6-10 in. long, consisting of solitary or fascicled flowers in the axils of scarious stipule-like bracts, with similar but smaller ones at their base. *Calyx* ⅛ in., sparsely hairy; upper teeth deltoid, lower linear. *Corolla* ¼ in., purple. *Pod* 1-2 in. long; *joints* 6-8, thin, a little broader than long, densely and persistently hairy.

Rohilkhand, in the Pilibhit dist., and in the Kheri dist. of N. Oudh (Duthie's collector). DISTRIB. Cent., W. and S. India to Ceylon; Assam, Khasia, Chittagong, Burma and Perak; also in Java, Tonkin and Hongkong.

12. D. pseudo-triquetrum, *DC. Prod. ii, 326.* D. triquetrum, *F. B. I. ii, 163 (in part).* D. triquetrum, subsp. pseudo-triquetrum, *Prain in Journ. As. Soc. Beng. LXVI, 300.* Hedysarum triquetrum, *Roxb.; Fl. Ind. iii, 347 (not of Linn.).*

Similar in many respects to the above, but easily distinguished by its prostrate habit, and by its pods which are quite glabrous except for a line of appressed hairs along each suture.

Dehra Dun. DISTRIB. Along the base of the Himalaya from Kángra to Sikkim and the Duars, also in the plains of Bengal, the Assam valley and on the Khasia and Naga Hills. Flowers during the rains.

13. D. gangeticum, *DC. Prod. ii, 327; W. & A. Prod. 225; D. & G. Bomb. Fl. 66; F.B.I. ii, 168; Watt E.D.* Hedysarum gangeticum, *Linn.; Roxb. Fl. Ind. iii, 349.* H. collinum, *Roxb. l.c.*—Vern. *Salpan.*

A slender suberect undershrub, 2-4 ft. high. *Stems* slightly angular, glabrescent, *branches* clothed with appressed white hairs. *Leaves* 1-foliolate; *petiole* ½-1 in.; *stipules* ¼ in., linear, subpersistent; *leaflets* 4-6 in. long, ovate-oblong, acute, rounded subcordate or truncate at the base, membranous or subcoriaceous, glabrous above, grey-puberulous beneath, main lateral nerves inconspicuous. *Racemes* copious, 6-12 in. long, axillary and terminal; *rachis* and *pedicels* puberulous; *bracts* minute, setaceous. *Flowers* in numerous close-set fascicles. *Calyx* very small, finely downy, teeth longer than the tube. *Corolla* about ¼ in., white or tinged with lilac. *Pod* ½-¾ in., falcate, deeply indented on lower suture; *joints* 6-8, indehiscent, a little longer than broad, clothed with minute hooked hairs.

Abundant within the area. DISTRIB. Outer Himalaya, up to 5,000 ft. and throughout India to Ceylon and Burma, Malay Penins. and Islands, China, Philippines and Trop. Africa. Flowers during the rainy season. The plant is used medicinally.

VAR. maculatum *F.B.I. l.c.* D. maculatum *DC. lc.*—A dwarf undershrub, 1 ft. or less in height. *Leaflets* small roundish-cordate.—Dehra Dun, Rohilkhand, N. Oudh, Gorakhpur, Bundelkhand. DISTRIB. Outer Himalaya, up to 4,000 ft., Upper Bengal.

14. **D. latifolium**, *DC. Prod. ii, 328; W. & A. Prod. 225; D. & G. Bomb. Fl. 66; Brand. For. Fl. 145; F. B. I. ii, 168; Watt E. D.* Hedysarum latifolium, *Roxb. Fl. Ind. iii, 350.*

An erect undershrub, 3-6 ft high; *branches* terete, fulvous-tomentose. *Leaves* 1-foliolate; *petiole* about ½ in., densely hairy; *stipules* small, subulate from a somewhat cordate base; *leaflets* 2-4 in. long, broadly ovate or suborbicular, acute or sub-obtuse, mucronate, cordate or truncate at the base, harshly pubescent above, brown-tomentose beneath, main lateral nerves conspicuous beneath. *Racemes* copious, 4-8 in. long, spike-like; *rachis* hairy; *flowers* fascicled; *pedicels* shorter than the small hairy calyx; *bracts* and *bracteoles* minute, hairy. *Calyx-teeth* lanceolate, as long as the tube. *Corolla* 3-4 times the calyx, purple. *Pod* ½-¾ in., deeply indented on lower suture, slightly so on upper; *joints* 4-6, as broad as long, clothed with minute hooked hairs.

Dehra Dun and Siwálik range, chiefly in sál forests, Rohilkhand. DISTRIB. Outer Himalaya up to 4,000 ft. in Sikkim, and throughout India to Ceylon, Burma, Siam, Malay Islands, Philippines, Trop. Africa and Madagascar. The fibre is used for making paper.

15. **D. brachystachyum.** *R. Grah. ex Benth. in Miq. Pl. Jungh. 223; F. B. I. ii, 171.*

A trailing herb with slender stem about 1 ft. long, glabrous except near the top. *Leaves* 1-foliolate; *petiole* ¼ in.; *leaflets* ¾-1¼ in. long, roundish or broadly oblong, obtuse or emarginate, cordate at the base, subcoriaceous, glabrous above, reticulate-veined and slightly hairy beneath. *Flowers* in short dense axillary and terminal subsessile racemes; *pedicels* ⅛-¼ in., reflexed at the tip as in *Uraria*. *Calyx* ⅛ in., densely

clothed with white hairs; teeth long, lanceolate-cuspidate. *Corolla* twice the calyx. *Pod* sessile, not longer than the calyx; *joints* 2, glabrous.

Upper Gangetic Plain (Buchanan-Hamilton, Edgeworth). DISTRIB. Chota Nagpur.

16. **D. gyrans,** *DC. Prod. ii, 326; W. & A. Prod. 227; Royle Ill. 191; Brand. For. Fl. 146; F. B. I. ii, 174.* Hedysarum gyrans, *Linn.; Roxb. Fl. Ind. iii, 351.*—The Telegraph plant.

An erect undershrub, 3-4 ft. high. *Branches* scarcely woody, subterete, finally glabrous. *Leaves* 1-3-foliolate; *petiole* about ½ in.; *stipules* lanceolate-acuminate, scarious, deciduous; *leaflets* very unequal, the terminal one 2-3 in. long, oblong-lanceolate, obtuse at both ends, glabrous above, glaucous and more or less silky beneath; lateral much smaller or obsolete; *stipels* linear-setaceous. *Racemes* axillary and terminal, often panicled, elongating after flowering; *bracts* ovate-acuminate, concealing the flower-buds, soon deciduous; *pedicels* ¼ in., downy. *Calyx* campanulate, glabrous; teeth deltoid, shorter than the tube. *Corolla* ½ in., pink. *Pod* 1-1½ in., falcate, flat, dehiscing continuously along the slightly indented ventral suture, downy; *joints* 6-10, inconspicuous, a little broader than long.

Dehra Dun and Siwalik range, in grassy places. DISTRIB. Outer Himalaya from Hazára to Assam, up to 7,000 ft., extending through W. and S. India to Ceylon and Burma; also in the Malay Islands and the Philippines. Flowers during the rains. The leaflets of this plant, especially the lateral ones, exhibit peculiar spontaneous jerky movements when exposed to the sun, even when the air is quite still.

VAR. Roylei, *F. B. I. ii, 175.* D. Roylei, *W. & A. Prod. 227.*—Terminal leaflet 3-4 in. long and twice as long as broad. *Corolla* rather larger. *Pod* glabrous.—Dehra-Dun. DISTRIB. Bengal, Assam, Sikkim.

17. **D. gyroides,** *DC. Mém. Leg. 322; W. & A. Prod. 227; F. B. I. ii, 175.* Hedysarum gyroides, *Roxb. Hort. Beng. 57.*

Similar in many respects to the last, but much taller, often reaching 10 ft. in height. Terminal leaflet broader in proportion to its length. *Pod* loosely pubescent and with a dense coating of reddish-brown tomentum.

Saharanpur district (Herb. Saharanpur). DISTRIB. Outer Himalaya from Garhwal to Khasia and Cachar, Ceylon, Burma, Malay Penins. and Islands.

57. SOPHORA, Linn.; Fl. Brit. Ind. ii, 248.

Trees or shrubs. *Leaves* odd-pinnate. *Flowers* showy, yellow-white or violet-purple, racemed or panicled. *Calyx* oblique, subgibbous, broadly campanulate; teeth deltoid, very short. *Corolla*

much exserted; *petals* equal in length, all with long claws, *standard* broad; *keel* obtuse, rarely appendaged. *Stamens* free, or obscurely connate at the very base; *anthers* uniform, versatile. *Ovary* stalked, many-ovuled, *style* incurved, *stigma* capitate. *Pod* moniliform, sub-lignose or membranous, usually indehiscent; *joints* turgid, terete or 4-winged.—Species about 25, chiefly in tropical and subtropical regions, a few temperate or alpine.

S. mollis. *R. Grah. in Wall. Cat. 5335; Brand. For. Fl. 132; F. B. I., ii, 251; Watt E. D.* Edwardsia mollis, *Royle Ill. 188, t. 32, f. 2.*

A low spineless shrub, with finely grey-downy branches. *Leaves* about 6 in. long; *leaflets* 21-35. coriaceous, ¼-⅔ in. long, elliptic, obtuse, emarginate, greyish-green, prominently veined, finely downy. *Flowers* appearing before the leaves, arranged in short dense axillary peduncled racemes which are shorter than the leaves. *Calyx* ⅛-¼ in., oblique, finely grey-downy. *Corolla* about ⅔ in. long, yellow. *Pod* 3-4 in. long, moniliform, 4-6-seeded, glabrous, *joints* with 4 distinct crustaceous wings. *Seeds* brown, shining.

Dehra Dun at Sahansradhára. DISTRIB. North-Western Frontier, Salt range, and on the W. Himalaya as far east as Kumaon ascending to 4,000 ft. The flowers which open in March and April are very showy and the plant is sometimes known as the *Himalayan Laburnum.*

Suborder II.—Cæsalpinieæ.

Trees or shrubs, rarely herbs. *Leaves* pinnate or 2-pinnate, with 1-many pairs of leaflets, rarely simple or 1-foliolate, usually exstipellate. *Flowers* irregular, or very rarely regular, usually 2-sexual. *Sepals* 5, or 4 from the fusion of the upper two, usually imbricate, rarely valvate or united in a toothed or lobed limb. *Petals* 5, or fewer by abortion, imbricate, the upper one innermost in bud. *Stamens* 10, or fewer by abortion, rarely indefinite, usually free. *Ovary* free, or united by its stipe to the disk-bearing calyx. *Seeds* usually exalbuminous.

Leaves simply pinnate, or (in Bauhinia) 1-foliolate.

- Anthers basifixed, petals 5 (TRIBE IX., CASSIEÆ) . . . . 58. CASSIA.
- Anthers versatile.
  - Petals 5, stamens free (TRIBE X., BAUHINIEÆ) . . . . 59. BAUHINIA.
  - Petals 3, stamens 1-adelph. (TRIBE XI., AMHERSTIEÆ) . 60. TAMARINDUS.

Leaves 2-pinnate, anthers versatile (TRIBE XII., EUCÆSALPINIEÆ).
Pod not winged.
Sepals imbricate, pod not moniliform . . . . . 61. CÆSALPINIA.
Sepals valvate, pod moniliform . 62. PARKINSONIA.
Pod winged along the upper suture . 63. MEZONEURUM.
Pod winged at the apex . . 64. PTEROLOBIUM.

58. CASSIA. Linn.; Fl. Brit. Ind. ii, 261.

Erect shrubs or trees, rarely herbs. *Leaves* abruptly pinnate. *Flowers* usually large and showy, in axillary racemes and terminal panicles. *Calyx-tube* very short; *sepals* broad or narrow, imbricated. *Petals* 5, imbricated, sub-equal, usually broad. *Stamens* normally 10, but rarely all perfect, 3-5 being often reduced to staminodes, or altogether absent; *anthers* usually basifixed, dehiscing sometimes by terminal pores. *Ovary* sessile or stalked, many-ovuled; *style* incurved; *stigma* terminal. *Pod* very variable, terete or flat, usually septate, dry, dehiscent or indehiscent, the albuminous flattened seeds sometimes parallel with the valves, sometimes with the septa.—Species about 380, everywhere in the tropics, a few extra-tropical.

Trees, shrubs or stout herbs, with large leaflets and obtuse sepals.
Stamens 10, all fertile.
Lower 2 or 3 stamens with longer filaments and larger anthers; pods very long, terete, indehiscent; seeds separated by thin transverse partitions. (Sect. FISTULA) . . 1. *C. Fistula.*
Stamens nearly equal in length; pods flat, dehiscent. (Sect. PSILORHEGMA) . . . . . 2. *C. glauca.*
The 3 upper stamens barren (Sect. SENNA); pods dehiscent, more or less compressed.
Leaf-rachis with a single gland at the base.
Leaflets 3-5 pairs . . . . . 3. *C. occidentalis.*
Leaflets 8-12 pairs . . . . . 4. *C. Sophera.*
Leaf-rachis with glands between 1 or more pairs of leaflets.
One gland between the lowest pair of leaflets . . . . . 5. *C. obtusifolia.*
One gland between the leaflets of each pair . . . . . 6. *C. auriculata.*
Leaf-rachis without glands . . 7. *C. obtusa.*

Herbs or small undershrubs, sepals usually acute.

Leaflets 4, rather large, membranous; sepals oblong, obtuse or slightly acute (Sect. ABSUS) . . . . . 8. *C. Absus.*

Leaflets very many, small narrow and rigidly coriaceous; sepals narrow, acute (Sect. CHAMÆCRISTA).

Gland of petiole stalked.

Stamens 5 . . . . . 9. *C. pumila.*

Stamens 10 . . . . . 10. *C. Kleinii.*

Gland of petiole sessile.

Stamens 5, the upper one often barren . . . . . 11. *C. dimidiata.*

Stamens 10, all fertile . . . 12. *C. mimosoides.*

Stamens 10, with 1-3 of the upper ones barren, flowers large . . 13. *C. Leschenaultiana.*

1. **C. Fistula,** *Linn. Sp. Pl. 377; Roxb.; Fl. Ind. ii, 333; W. & A., Prod. 285; Royle Ill. 184; D. & G. Bomb. Fl. 80; Brand. For. Fl. 164; F.B.I. ii, 261; Watt E.D.* C. rhombifolia, *Roxb.; Fl. Ind. ii, 334.*—Vern. *Amaltás, királa* (Dehra Dun), *kitwáli* (Bijnor). Indian Laburnum.

A medium-sized tree with thick yellowish or greenish-grey bark. *Leaves* 8-16 in. long, *rachis* terete; *leaflets* 4-8 pairs, distinctly stalked, 2-6 in. long, ovate, acuminate, entire, cuneate towards the base, coriaceous, shining above, clothed when young with caducous silvery pubescence; lateral nerves close, slender, prominent beneath. *Flowers* bright-yellow, in long axillary pendulous lax racemes 1-2 ft. long; *pedicels* 1-2 in., spreading; *bracts* minute, caducous. *Calyx* 5-partite; lobes about ½ in long, nearly equal, ovate, obtuse, caducous. *Petals* ¾ in. long, nearly equal, obovate, shortly clawed, veined. *Stamens* 20, all with anthers, the 3 lowest with long thick curving filaments and large anthers opening by slits, the 4-6 intermediate ones with shorter filaments and smaller diverging anther-lobes opening by pores, the remaining 1-3 with still shorter filaments and indehiscent anther-lobes. *Pod* cylindrical, pendulous, 1-2 ft. long and about 1 in. in diam, indehiscent, smooth, hard, dark-brown or black, transversely divided into numerous 1-seeded cells by brittle ligneous dissepiments. *Seeds* flat, embedded in soft black sweetish pulp, albuminous.

Abundant in forest tracts throughout the area, also much cultivated in gardens. DISTRIB. Outer Himalaya up to 4,000 ft., and hilly tracts throughout India from the Punjab to Ceylon, Malaya, Malay Islands and China. Flowers April—July, and the fruit ripens in the cold season. The bark is used in dyeing and tanning. The pulp of the fruit and other parts of the tree are used medicinally. The wood is very durable, but it is difficult to obtain large enough pieces for timber purposes. The twigs are sometimes lopped for cattle fodder. An extremely handsome tree when in flower.

2. C. glauca, *Lamk. Encycl. i, 647; W. & A. Prod. 289; F. B. I. ii, 265 (excl. syn C. fastigiata, Vahl); Watt E. D.; Prain in Journ. As. Soc. Beng. LXVI. part ii 477.* Senna arborescens, *Roxb. Fl. Ind. ii, 345.*

A small tree, with glabrous terete branches. *Leaves* 6-9 in. long; *rachis* slightly channelled above and furnished with long conical glands between each of the 2-3 lowest pairs of leaflets; *stipules* falcate, narrowly lanceolate, caducous; *leaflets* 4-6 pairs, opposite, 2-4 in. long, ovate, acute, cuneate at the base, pale-green and glabrous above, very glaucous and sparsely appressed-puberulous or glabrous beneath. *Flowers* 2½ in. across, in axillary corymbs 4 in. long; *pedicels* spreading glabrous; *bracts* small, elliptic, glabrous, caducous. *Calyx* 5-partite to the base; segments orbicular, very unequal, pale-yellow. *Petals* about 1 in. long, nearly equal, spreading, broadly ovate, obtuse, pale primrose with greenish-yellow veins. *Stamens* 10, sub-equal. *Pod* 6-8 in. long, stalked, linear, straight, flat, thin, flexible, dehiscent. *Seeds* 20-30, in 2 rows, thin, dark-brown, shining.

Merwara (Duthie), Bundelkhand (Mrs. Bell). DISTRIB. From the foot of the Himalaya to S. India, but very often planted; also in the Malay Penins. and Islands, and in N. Australia.

VAR. suffruticosa, *F. B. I. ii, 265.* C. suffruticosa, *Kœn.; W. & A. Prod. 289.* C. fastigiata, *Vahl; W. & A. Prod. 290.* Senna speciosa, *Roxb. Fl. Ind. ii, 347.* *Leaflets* 8–9 pairs, smaller, obtuse; *flowers* and *pods* much smaller, the latter not more than 3-4 in. long; *seeds* 10–12.—Dehra Dun (Wallich), Siwalik range (Royle), Bundelkhand. (Mrs. Bell). DISTRIB as of type.

3. C. occidentalis, *Linn. Sp. Pl. 377; W. & A. Prod. 290; Royle Ill. 184; D. & G. Bomb. Fl. 81; F. B. I. ii, 262; Watt E. D.* Senna occidentalis, *Roxb. Fl. Ind. ii, 343.*—Vern. *Kásunda, chakunda.* (Coffee Senna, or Negro coffee.)

A diffuse subglabrous undershrub, 2-5 ft. high, often only of annual growth. *Leaves* 6-8 in. long, *petiole* with a single gland at the base; *leaflets* 3-5 pairs, opposite, shortly stalked, 1-3 in. long, ovate-oblong or lanceolate, acuminate, rounded at the base, glaucous, glabrous above, finely pubescent beneath, fœtid. *Flowers* in axillary short-peduncled corymbs arranged in a terminal panicle; *bracts* ½ in. long, ovate-acuminate, white tinged with pink, caducous. *Calyx* 5-partite to the base, lobes obtuse. *Petals* ½ in., yellow faintly veined with orange. Fertile *stamens* 7, the 3 upper reduced to staminodes, the 3 lower longer and with larger authers than those of the lateral pairs, *anthers* brown. *Pod* 4-5 in. long, slightly falcate, compressed, transversely septate, torulose. *Seeds* 20-30, pale-brown.

Abundant within the area on roadsides and in waste ground. DISTRIB. Throughout India, extending to Ceylon, Burma and the Malay Penins.; cosmopolitan in the tropics. Probably originally introduced from America. Flowers during the rains. The leaves, root and seeds are medicinal. The seeds after being roasted and ground are used in Trop. Africa and the Mauritius as a substitute for coffee.

4. **C. Sophera,** *Linn. Sp. Pl. 379; W. & A. Prod. 297; D. & G. Bomb. Fl. 81; F. B. I. ii. 262; Watt E. D.* Senna Sophera, *Roxb. Fl. Ind. ii, 347.* S. esculenta, *Roxb. l.c.*—Vern. *Kásunda.*

A diffuse subglabrous shrub, 8-10 ft. high, annual or subperennial. *Leaves* 8--10 in. long, fœtid; *rachis* with a single gland at the base; *leaflets* 8--12 pairs, 2-3 in long, lanceolate, acuminate, cuneate at the base, glabrous and glaucous. *Flowers* in axillary distinctly peduncled corymbs; *bracts* green, caducous *Petals* subequal, yellow, hardly at all veined *Stamens* as in *C. occidentalis. Pod* 3-4 in. long, slightly falcate, turgid, transversely septate, not torulose. *Seeds* 30—40, dark-brown.

Bundelkhand (Edgeworth), Merwára (Duthie). DISTRIB. Throughout India to Ceylon and the Malay Penins., but much less abundant than *C. occidentalis.* Cosmopolitan in the tropics, and probably of American origin. Various parts of the plant are used medicinally.

VAR. purpurea, *Roxb. Hort. Beng. 31 (sp.); Royle Ill. 184.* Senna purpurea, *Roxb. Fl. Ind. ii, 342.*--Vern. *Kasundi.*--A large erect much branched annual with reddish-purple branches and petioles; *leaflets* smaller.—Merwára (Duthie). DISTRIB. Coromandel coast, Bengal, Assam.

5. **C. obtusifolia,** *Linn. Sp. Pl. 377; Prain in Journ. As. Soc. Beng. LXVI, part ii, 159, 475.* C toroides, *Roxb. Hort. Beng 31.* C. Tora, var β. *W. & A. Prod 291 (in part).* C. Tora, *F. B. I. ii, 263, in part not of Linn.); Royle Ill. 184; D. & G. Bomb. Fl. 81; Watt E. D.* Senna toroides, *Roxb. Fl. Ill. ii, 340.*—Vern. *Panwár.*

An annual, or occasionally an undershrub up to 7 ft. high. *Leaves* 3-4 in. long, petioled, not fœtid; *stipules* ¾ in., linear, caducous; *rachis* puberulous, deeply grooved above, furnished with a single conical gland between the lowest pair of leaflets; *leaflets* 3 pairs, 1-2 in. long, obovate-oblong, broadly deltoid at the apex, rather obliquely rounded at the base membranous, green, glabrous or puberulous on both surfaces; lateral nerves 8-10 pairs, indistinct. *Flowers* usually in subsessile pairs in the leaf-axils. *Calyx* 5-partite to the base. lobes green *Petals* bright-yellow, ½ in. long, *standard* truncate. *Stamens* 7, the 3 upper reduced to staminodes. *Pod* 8-10 in. long, subterete, obliquely septate; valves membranous, glabrous, distinctly transversely reticulated, sutures broad. *Seeds* 30-35, brown, shining.

A very common weed all over the area by roadsides and in waste ground, flowering during the rains. DISTRIB. Abundant in Northern, Western and Central India, ascending to 4,000 ft. on the W. Himalaya; it is found also in Burma, and is very common at Singapore. It was introduced originally from Tropical America. The leaves, seeds and root are used medicinally; the tender leaves are boiled and used as a potherb, and the seeds are eaten in times of scarcity. This plant was long ago recognized by Roxburgh as a species distinct from *C. Tora,* with which it has been united in the Fl. Brit. Ind. and by the majority of Indian authors. Dr. Prain, in the Journ. As. Soc Beng. l.c., has finally cleared

the way for its restoration as a separate species. The true *C. Tora* of Linnæus differs from his *obtusifolia* by having glaucous fœtid and prominently veined leaflets. there are 2 glands on the rachis, the pedicels are shorter, and the flowers are much smaller.

6. C. auriculata, *Linn. Sp. Pl. 379; W. & A. Prod. 299; D. & G. Bomb. Fl 81; Brand. For. Fl. 165; F. B. I. ii, 263; Watt E. D.* Senna auriculata, *Roxb. Fl. Ind. ii, 349.*—Vern. *Tarwar, awal* (Rájputána).

A tall shrub with finely downy spreading branches. *Leaves* nearly sessile, approximate, 3-4 in. long; *rachis* grooved, pubescent, furnished with a single linear gland between the leaflets of each pair; *stipules* broad, leafy, persistent, their inner bases with filiform points; *leaflets* 8-12 pairs, ½-1 in. long, slightly overlapping, obovate-oblong, obtuse or emarginate, mucronate, rigidly subcoriaceous, downy. *Flowers* nearly 2 in. in diam. in copious corymbose racemes. *Calyx-lobes* unequal. *Petals* bright-yellow, crisped at the margins and with long claws. *Pod* 4-5 in., straight, ligulate, obtuse. flexible, glabrous or pilose; dark-brown. *Seeds* 10-12, distant.

Districts of Etáwah and Gorakhpur, Bundelkhand, Ajmere and Merwára. DISTRIB. From Cent. and S. India to Ceylon. often planted elsewhere. It is a very handsome shrub when in flower during the cold season. The bark is much used for tanning and dyeing leather; the seeds, bark and leaves are medicinal; the leaves are eaten as a vegetable in times of scarcity, and the branches are much valued for tooth-sticks.

7. C. obtusa. *Roxb. Hort Beng. 31; W. & A. Prod. 288.* C. obovata, *Collad.; Brand. For. Fl. 165; F. B. I. ii, 264; Watt E. D.* Senna obtusa, *Roxb. Fl. Ind. ii, 344.*

A diffuse subglabrous annual or perennial herb, 1-4 ft. high, branches angular. *Leaves* 2-3 in. long, petioled; *rachis* glabrous, without glands; *stipules* lanceolate, persistent; *leaflets* 4-6 pairs, shortly stalked, ½-1½ in. long, obovate-oblong, obtuse, minutely mucronate, unequal at the base, membranous, glaucous beneath. *Racemes* narrow few-flowered, finally equalling or exceeding the leaves; *pedicels* very short. *Flowers* about ¾ in. *Sepals* obtuse, glabrous. *Corolla* pale-yellow. *Stamens* very unequal, *anthers* opening by pores. *Pod* 1-1½ in. long by ⅝ in. wide, shortly stalked, much curved, rounded at the ends, flexible, glabrous; valves cartilaginous, marked on the sides with rounded prominent crests over the seeds. *Seeds* 6-12, obovate-cuneate, separated by very thin partitions, funicles long.

Near Delhi (Herb. Royle). DISTRIB. Salt range, Punjab on the Deraját, Sind, Gujarát, S. India and Ceylon; also in E. Trop Africa, Arabia, Abyssinia and Egypt. The leaves are collected and sold for medicinal purposes This was the first kind of *senna* known. and it was formerly largely cultivated in N. Italy and in other parts of Europe.

8. C. Absus, *Linn Sp. Pl. 376; W. & A. Prod. 291; Royle Ill. 184; F. B. I. ii, 265; Watt E. D.* Senna Absus, *Roxb. Fl. Ind. ii, 340.* S. exigua, *Roxb. l. c. 339.*—Vern. *Cháksu.*

An erect annual 1-2 ft. high, clothed with grey bristly viscous hairs. *Leaves* on long petioles; *stipules* small, linear, acute, persistent; *rachis* with a small linear gland between the leaflets of each pair; *leaflets* 4, membranous, 1-2 in. long, oblong, obtuse or subacute, unequal at the base, hairy beneath. *Racemes* erect, few-flowered, narrow, equalling or exceeding the leaves. *Flowers* very small. *Sepals* ⅛—¼ in., lanceolate, bristly. *Corolla* reddish-yellow: petals with long claws, veined. *Stamens* 5, equal, all fertile, *anthers* opening by slits. *Pod* 1-1½ in., ligulate, oblique; valves thin, beset with grey bristly hairs. *Seeds* 5, compressed, dark-brown, shining.

Abundant in Dehra Dun, Rohilkhand and N. Oudh, also in the Agra district and in Merwára. DISTRIB. Throughout India to Ceylon, and everywhere in the tropics of the old world. Flowers during the rainy season. The seeds have long been known as a remedy for ophthalmia. Roxburgh describes the flowers of his *S. exigua* as 4-androus.

9. C. pumila. *Lamk. Encycl. i, 651; W. & A. Prod. 292; F. B. I. ii, 266.* C. prostrata, *Wœn. ex. Roxb. Hort. Beng. 32; D. & G. Bomb. Fl. 82.* Senna prostrata, *Roxb. Fl. Ind. ii, 352.*

A diffuse procumbent shrub with slender terete finely downy branches. *Leaves* 1-2 in. long, gland at base of petiole stalked; *stipules* semi-lanceolate, rigid, persistent; *leaflets* 20-40, close, ¼-½ in. long, linear, acute, rigidly coriaceous, strongly veined, mucronate, more or less hairy, the midrib close to the upper border. *Flowers* usually solitary in the axils of the leaves, on very short pedicels. *Sepals* ¼ in., acute. *Corolla* little exserted. *Stamens* 5, *anthers* equal. *Pod* 1-1½ in., straight, flat, linear, torulose, glabrous or nearly so, 6-12-seeded.

Common within the area. DISTRIB. Throughout India, ascending to 6,000-7,000 ft. on the Himalaya; also in the Malay Islands and in trop. Australia. Flowers during the rains.

10. C. Kleinii. *W. & A. Prod. 293; E. B. I. ii, 266.*

Suffruticose; branches diffuse, procumbent, more or less pubescent. *Leaf-rachis* with a stalked gland below the lowest pair of leaflets; *stipules* subulate; *leaflets* of upper leaves 10-20 pairs, fewer on the lower ones, ⅓-¼ in. long, linear-oblong, unequal-sided and somewhat falcate, mucronate, *Flowers* 1-3 in the axils of the leaves; *pedicels* downy, bracteate. *Petals* obovate, little exserted. *Stamens* 10, alternately longer and shorter. *Pod* 1½-2 in. long, flat, somewhat falcate, black, glabrescent. *Seeds* 10-15.

Merwára (Duthie). DISTRIB. S. India and in Ceylon, also in Java.

11. C. dimidiata. *Roxb. Hort. Beng. 32; Fl. Ind. ii, 352; Prain in Journ. As. Soc. Beng. LXVI, part ii, 477.* Senna dimidiata, *Buch.-Ham. in Roxb. Fl. Ind. ii, 352.*

A slender erect annual or biennial up to 3 ft. high, young parts puberulous. *Leaves* 2-3 in. long; *rachis* with a single rather large sessile gland below the lowest pair of leaflets; *stipules* subulate; *leaflets* 30 pairs, semi-lanceolate, glabrous. *Flowers* small, 3-4 together in the leaf-axils, on a

short common peduncle; *pedicels* slender, elongating. *Stamens* 5, the upper one often smaller and reduced to a staminode. *Pod* straight, glabrous. *Seeds* 6-15.

Saharanpur district. DISTRIB. W. Himalaya from Simla to Nepal, also on Mt. Abu.

12. C. mimosoides, *Linn. Sp. Pl. 379; F. B. I. ii, 266; Watt E. D.; Prain in Journ. As. Soc. Beng. LXVI, part ii, 164, 477.* C. angustissima, *Lamk.; W. & A. Prod. 292.* Camœma, *Ruch.-Ham.; Royle Ill. 194.* Senna sensitiva and tenella, *Roxb. Fl. Ind. ii, 353, 354.*

A low diffuse glabrous or pubescent perennial, or sometimes suffrutescent, with a simple or much branched stem. *Leaves* 3-4 in. long; *rachis* puberulous, with a small sessile gland below the lowest pair of leaflets; *stipules* ¼ in., straight, subulate; *leaflets* 40-60 pairs, ⅒-¼ in. long, linear, obliquely mucronate, glabrous on both surfaces. *Flowers* solitary or 2-3 together in the leaf-axils, about ½ in. long; *pedicels* unequal, ultimately 1 in. long, bracteolate above the middle; *buds* narrow, pointed. *Stamens* 10, perfect, alternately longer and shorter. *Pod* 2 in. long, linear, flattish. *Seeds* 20—25.

Plentiful within the area. DISTRIB. Throughout India to Ceylon and the Malay Penins., ascending to 6,000 ft. on the Himalaya; cosmopolitan in the tropics. Flowers during the rains. The root is used medicinally.

13. C. Leschenaultiana, *DC. Mém. Soc. Phys. Genév ii, 132; Prain in Journ. As. Soc. Beng. LXVI, part ii, 165, 477.* C. Wallichiana. *DC.; W. & A. Prod. 292.* C. mimosoides *var.* Wallichiana, *F. B. I. ii, 266.*

A softly pubescent suberect annual, 2-3 ft. high. *Leaves* 1-2 in. long; *rachis* pubescent, with a large sessile gland below the lowest pair of leaflets; *stipules* about ¼ in. long, lanceolate, straight; *leaflets* 16-24 pairs, ⅜-⅝ in. long, narrowly oblong, obliquely mucronate, glabrous or puberulous, lateral nerves 4-6, prominent and very oblique. *Flowers* solitary or 2-3 together in the leaf-axils, ⅜-⅝ in. long; *pedicels* bracteolate a little above the base; *buds* pointed. *Stamens* 10 or 9 or 7, all perfect or 1-3 of the uppermost reduced to staminodes. *Pod* 1-1½ in. long, linear, flattish. *Seeds* 8-16.

Common within the area. DISTRIB. Throughout India to Ceylon and the Malay Penins., ascending to 6,000 ft. on the Himalaya. Flowers during the rains. Easily distinguished from *C. mimosoides* by its much larger flowers and glaucous foliage.

Ceratonia Siliqua, L., is the well-known Carob or Locust-tree, a native of the Mediterranean region. It was introduced into India by Dr. Royle in 1840, but its experimental cultivation has not as yet been attended with any great success. It is a slow-growing evergreen tree with abruptly pinnate leaves, the flowers are usually dioecious and without petals, stamens 5 with versatile anthers, and there is a prominent disk surrounding the ovary; the embryo is inclosed in fleshy albumen. The tree grows well in India, but the production of pods is deficient. In Italy and Spain it is usually propagated by grafts, by which means a larger

proportion of pod-bearing trees is secured. For further particulars see Dr. Watt's Dictionary article.

Saraca indica, L., Vern. *Asok*, is an evergreen tree much cultivated in gardens for the sake of its very handsome orange-red flowers. Being regarded by the Hindus as a sacred tree, it is often planted near temples. It is found wild at low elevations on the Himalaya from Kumaon eastwards, also in E. Bengal, Burma, S. India and Ceylon.

59. BAUHINIA, Linn.; Brit. Ind. ii, 275.

Unarmed erect trees or climbers with circinate tendrils. *Leaves* simple, usually more or less deeply cleft from the tip, rarely entire or fully divided into 2 leaflets. *Flowers* usually showy, sometimes small, in copious simple or panicled often corymbose racemes. *Calyx-tube* with the disk produced to the top, sometimes long and cylindric, sometimes short and turbinate; limb entire and spathaceous, or cleft into 2 or 5 teeth. *Petals* 5, subequal, usually with a distinct claw. *Stamens* 10, or reduced to 5 or 3 or 1, if fewer than 10 with or without sterile filaments; *filaments* free, filiform; *anthers* versatile, dehiscing longitudinally. *Ovary* stalked, many-ovuled; *style* long or short; *stigma* small or large, peltate subterminal or oblique. *Pod* linear or oblong, flat, continuous within, dehiscent or indehiscent. *Seeds* albuminous.—Species 150, spread throughout the tropics.

Fertile stamens 10.	
A shrub with large yellow flowers, pod dehiscent	1. *B. tomentosa.*
Trees with small whitish flowers and indehiscent pods.	
Calyx spathaceous, pod falcate, irrgularly reticulate-veined	2. *B. racemosa.*
Calyx 5-cleft; pod straight, marked with diagonal parallel veins	3. *B. malabarica.*
Fertile stamens 3-5.	
Leaflets connate to the apex, perfect stamens 3	4. *B. retusa.*
Leaves deeply cleft.	
A robust climber with large corymbs of yellow flowers, stamens 3	5. *B. Vahlii.*
A tree with the calyx 2-cleft, stamens 3 or 4	6. *B. purpurea.*
A tree with spathaceous calyx, stamens 5	7. *B. variegata.*

1. **B. tomentosa**, *Linn., Sp. Pl. 375; Roxb.; Fl. Ind. ii, 323; W. & A. Prod. 295; Brand. For. Fl. 159; F. B. I. ii, 275; Watt E. D.*

A shrub, with ash-coloured bark and slender zigzag downy branches. *Leaves* broader than long, 1½-2 in. across, cleft less than half-way down into 2 obtuse lobes, mucronate in the sinus, truncate at the base, 7-nerved, shining and glabrous above, pubescent and whitish beneath; *petiole* ½-¾ in., swollen at both ends; *stipules* setaceous. *Flowers* large, usually in short-peduncled leaf-opposed pairs; *bracteoles* linear, persistent. *Calyx limb* ¼ in. long, spathaceous, splitting down to the funnel-shaped tube, finely pubescent. *Petals* 1½—2 in. long, obovate-spathulate, yellow, the upper with a red blotch on the face. *Stamens* 10, all fertile. *Ovary* distinctly stalked, densely tomentose; *style* long, straight. *Pod.* 4-5 in. long and ½ in. or more wide, dehiscent, finely pubescent, becoming glabrous when ripe. *Seeds* 10—16, flattened, dark-brown, shining.

Bundelkhand. DISTRIB. C. & S. India to Ceylon, Malay Penins. and Islands; also in China and Trop. Africa. The flower-buds, and other parts of the plant are used medicinally. The leaves are used at Hindu religious ceremonies.

2. **B. racemosa,** *Lamk, Encycl. i, 390; W. & A. Prod. 295; D. & G. Bomb. Fl. 82; Brand, For. Fl. 159; F. B. I. ii, 276; Watt E. D.*—Vern. *Kachnál, gurial, ashtá* (Oudh), *jhanjhora jhinghora and pápri* (Dehra Dun and Saharanpur), *mahauli* (Bundelkhand).

A small crooked tree, with thick rough brownish bark and drooping branches. *Leaves* 1½—2 in., broader than long, deeply cleft, slightly cordate at the base, 7-9-nerved, coriaceous, more or less densely grey-pubescent beneath. *Racemes* terminal and leaf-opposed, 3-6 in. long; *rachis* downy; *pedicels* ½-¾ in.; *bracts* subulate, deciduous; *buds* lanceolate *Calyx-limb* about 3 times as long as the turbinate tube, spathaceous, 5-toothed, finally reflexed. *Petals* oblanceolate, pale-yellow, as long as the calyx-limb. *Stamens* 10, all perfect. *Pod* stalked, 6-12 in. by ½-1 in. wide, falcate, firm, not distinctly veined, torulose indehiscent. *Seeds* 12-20.

Forests of Dehra Dun and Siwalik range, N. Oudh, Merwára. DISTRIB. Outer Himalaya from the Rávi eastwards, ascending to 5,000 ft. in Kumaon, extending from Behar to Ceylon, Burma and the Malay Islands, also in China. Flowers March to June. The bark yields a useful fibre, it is used also for torches and slow matches. The leaves are made into cigarette covers (bidis), and are also used medicinally. The tree is regarded as sacred by the Hindus.

3. **B. malabarica,** *Roxb. Hort. Beng. 31; Fl. Ind. ii, 321; W. & A. Prod. 294; D. & G. Bomb. Fl. 82; Brand For. Fl. 159; F. B. I. ii, 277; Watt E.D.*—Vern. *Amli, imli, khat pápri, khatta jhinjhora.*

A small or medium-sized tree with brownish bark. *Leaves* broader than long, with 2 obtuse lobes reaching about ⅓ of the length, slightly cordate, glabrous and glaucous beneath, 7-9-nerved, acid. *Racemes* 1½-2 in. long, dense, sometimes 2 or 3 together in the axils: *pedicels* ¼-1 in., slender, ascending; *bracts* triangular, deciduous; *buds* obovoid. *Calyx* clothed with brown tomentum; limb 5-cleft, twice as long as the cylindrical tube. *Petals* spathulate, little exserted. *Stamens* 10,

all fertile. *Style* produced. *Pod* stalked, up to 12 in. in length by ¾-1 in. broad, nearly straight, acuminate, firm, glabrous; valves marked with distinct diagonal parallel veins. *Seeds* 20—30.

Forests of Dehra Dun and of the Siwalik range, Rohilkhand and N. Oudh. DISTRIB. Outer Himalaya, at low elevations, from the Jumna to Assam, hilly parts of Chota Nagpur and in C. and S. India to Burma; also in the Malay Islands and Java. Flowers October and November. The leaves are very acid and are sometimes eaten In the Fl. Brit. India l.c. a variety named *reniformis* B. reniformis, *Royle Mss.* (*sp.*) is described as having leaves as small as those of B. *racemosa* and densely pubescent beneath. I have seen no specimens.

4. B. retusa, *Roxb. Hort. Beng. 31; Fl. Ind. ii, 322; Brand. For. Fl. 161; F. B. I. ii, 279; Watt E.D.* B. emarginata, *Wall.; Royle Ill. 185.*—Vern. *Semla.*

An erect medium-sized tree, with dark-brown bark. *Leaves* 4-6 in. long and rather broader than long, entire or emarginate at the apex, cordate or truncate at the base, 9-11-nerved, coriaceous, glabrous or finely pubescent beneath, petiole 1½-3½ in. *Flowers* ½ in. across, on long slender pedicels, arranged in ample terminal corymbose panicles, the branches clothed with grey silky pubescence. *Calyx* ⅓ in., split nearly to the base into 2-3 segments, *buds* ovoid. *Petals* twice as long as the calyx, oblong or obovate, pale-yellow spotted with red and veined with purple. Fertile *stamens* 3. *Ovary* hairy below, its stalk adnate to the calyx-tube, *style* produced, *stigma* long. *Pod* 4-6 in., oblanceolate, flat, bright brownish-red till ripe, dehiscing late. *Seeds* 6-8, brown, smooth.

Dehra Dun and Siwalik range. DISTRIB. Abundant on the Outer Himalaya from Simla to Nepal, up to 4,000 ft.; also in Chota Nagpur and in the Central Provinces. Flowers September to November. A clear gum, resembling gum arabic in appearance, is obtained from incisions made in the bark. It is annually exported from Dehra Dun, and is used chiefly for medicinal purposes and in the manufacture of native sweetmeats.

5. B. Vahlii, *W. & A. Prod. 297; D. & G. Bomb. Fl. 83; Brand. For. Fl. 161; F. B. I. ii, 279; Watt E. D.* B. racemosa, *Vahl; Roxb. Fl. Ind. ii, 325; Royle Ill. 184 (not of Lamk.).*—Vern. *Maljhan, málu.*

An immense climber, with thick cable-like branches. Young parts and leaves beneath rusty- or grey-velvety; branchlets usually ending in a pair of strong revolute tendrils. *Leaves* up to 18 in. across, about as broad as long, deeply cordate, cleft to about ⅓ of the length, 11-13-nerved; lobes obtuse, diverging, rigidly subcoriaceous, dark-green and glabrescent above, persistently tomentose beneath; *petiole* stout, 3-6 in. long; *stipules* obtuse, falcate. *Flowers* ¾ in. across, in dense terminal long-peduncled corymbs or corymbose racemes; lower *pedicels* 1-2 in., with persistent linear bracteoles. *Calyx-tube* ⅓-½ in. long, cylindrical; limb splitting into 2 lobes, rusty-tomentose. *Petals* white, obovate, shortly clawed, hairy outside. *Stamens* 3. *Ovary* tomentose, its stalk adnate to the calyx-tube. *Pod* pendulous, 6-12

in. long and 1-2 in. broad, flat, woody, clothed with dense rusty-coloured tomentum. *Seeds* 8-12, flat, about 1 in. in diam., brown.

Dehra Dun and Saharanpur forests, Rohilkhand, N. Oudh and Bundelkhand. DISTRIB. Outer Himalaya from the Chenab to Assam, ascending to 4,000 ft., Chota Nagpur, and in C., W. and S. India. Flowers April to June. Found abundantly in sál forests where it does immense damage if allowed to have its way. Roxburgh described it as the largest and most extensive creeper he had ever seen, the branches extending from one to three hundred feet. The bark yields a very strong and coarse fibre, which is used locally by the natives for a variety of purposes. The seeds and leaves are used medicinally, and the seeds are also eaten as food after being roasted. Very serviceable umbrellas are made of the strong tough leaves, which are also used as plates, wrappers, etc.

6. **B. purpurea**, *Linn. Sp. Pl. 675; Roxb.; Fl. Ind. ii, 320; W. & A. Prod. 296; Royle Ill. 184; Brand. For. Fl. 160; F. B. I. ii, 284; Watt E. D.* B. triandra, *Roxb.; Fl. Ind. ii, 320.*—Vern. *Khairwál.*

A medium-sized tree with ash-coloured or brownish bark; young parts pubescent. *Leaves* 3-6 in. long, a little longer than broad, 9-11-nerved, slightly cordate at the base, subcoriaceous, glabrous; lobes subacute, reaching to about the middle, their inner edges often overlapping. *Flowers* few, in terminal and axillary short-peduncled corymbose racemes; *bracts* minute, deltoid. *Calyx-tube* ¼-½ in.; limb twice as long, coriaceous, usually split into 2 segments, the lower one emarginate, the other 3-toothed. *Petals* deep rose-coloured, 1-2 in. long, clawed, glabrous. Fertile *stamens* 3 or 4, elongate, ascending. *Ovary* long-stalked, grey-downy; *style* long; *stigma* large, oblique. *Pod* 6-12 in. long, linear, flat, rather decurved, pointed, greenish tinged with purple, glabrous, late in dehiscing. *Seeds* 12-15.

Forests of Dehra and on the Siwalik range, Rohilkhand, N. Oudh and Bundelkhand. DISTRIB. Punjab Hills and outer Himalaya, up to 4,000 ft., Khasia Hills, Cent. and S. India; also in China. It is cultivated in gardens throughout India. Flowers September-November. The bark is used for dyeing and tanning, and from the inner portion a fibre is prepared. The bark and leaves are medicinal. The flower-buds (*kalli*) are eaten as a potherb or pickled, and the foliage is given to cattle as fodder.

7. **B. variegata**, *Linn. Sp. Pl. 375; Roxb.; Fl. Ind. ii, 319; W. & A. Prod. 296; Brand. For. Fl. 160; F. B. I. ii, 284; Watt E. D.* B. candida, *Roxb.; Fl. Ind. ii, 318.*—Vern. *Kachnár.*

Very similar in habit to the preceding. *Leaves* rather broader than long, 4-6 in. across, usually deeply cordate, the obtuse lobes reaching ¼ or ⅓ of the way down, rigidly subcoriaceous, 9-11-nerved. *Flowers* few, large, fragrant, arranged in lateral corymbs; *pedicels* short or 0; *bracts* minute, deltoid. *Calyx-tube* ¾-1 in. long; limb spathaceous, not split, 5-toothed, hairy outside. *Petals* about 2 in. long, usually four of them white, and the upper one red and veined with purple, or all of them reddish with the upper one more deeply coloured and variegated with

cream and purple. Fertile *stamens* usually 5. *Ovary* long-stalked, *style* long, *stigma* minute. *Pod* 6-12 in. long, and ½-¾ in. wide, hard, flat, glabrous, rather decurved, dehiscent *Seeds* 10-15.

Forests of Dehra Dun and of the Siwalik range, Rohilkhand, Oudh and Bundelkhand DISTRIB. Outer ranges of the Himalaya up to 4,000 ft., and throughout India and in Burma; also in China. Flowers February to April before the new foliage appears. It is cultivated in gardens. The flower-buds are eaten as a vegetable and the tree yields other economic products similar to those of *B. purpurea*.

B. acuminata, Linn. Sp. Pl. 376; Roxb.; Fl. Ind. ii, 324; W. & A. Prod. 295; Brand. For. Fl. 159; F. B. I. ii. 276; Watt E. D.—An erect shrub with large white flowers, often met with in gardens within the area. It is found wild in Bengal, Burma, the Andamans, Malay Penins. and Islands and in China. It is included in the same section to which *B. tomentosa* belongs.

60. TAMARINDUS, Linn.; Fl. Brit. Ind. ii, 273.

A spineless tree. *Leaves* abruptly pinnate. *Flowers* racemed. *Calyx-tube* turbinate; disk produced some distance above its base; teeth lanceolate, much imbricated, the two lowest connate. *Petals* only the three upper developed, the two lateral ovate, the upper hooded, the two lower reduced to scales. *Stamens* monadelphous, only 3 developed, the others reduced to mere bristles at the top of the sheath; *anthers* oblong, versatile, dehiscing longitudinally. *Ovary* many-ovuled, with a stalk adnate to the calyx-tube; *style* filiform, *stigma* capitate. *Pod* linear-oblong, many-seeded, with a thin crustaceous epicarp and thick pulpy mesocarp. *Seeds* exalbuminous.—A single species, planted everywhere in the tropics, and probably a native of Trop. Africa.

T. indica, *Linn.; Roxb. Fl. Ind. iii, 215; W. & A. Prod. 285; D. & G. Bomb. Fl. 82; Brand. For. Fl. 163; F. B. I. ii, 273; Watt E. D.*—Vern. *Imli, amli.* (Tamarind).

A large handsome tree, 80 ft. or more in height. *Leaves* 3-6 in. long; *leaflets* 10-20 pairs, oblong, obtuse, glabrescent. *Flowers* few together, in copious lax racemes at the end of short lateral branchlets; *pedicels* jointed at the base of the calyx; *bracts* boat-shaped, inclosing the buds, caducous. *Petals* less than ½ in. long, yellow striped with red. *Pod* 3-8 in. long and about 1 in. broad, usually falcate, indehiscent. *Seeds* many, compressed, ½ in. in diam., dark-brown and shining.

Planted in many parts of the area for the sake of its fruit, also as an ornamental tree in gardens. It has become naturalized in many places; and, when met with in the midst of forests on the sites of deserted villages, it often has all the appearance of an indigenous tree. For an account of its many useful properties Dr. Watt's Dictionary article should be consulted.

61. CÆSALPINIA, Linn.; Fl. Brit. Ind. ii, 254.

Robust erect trees, shrubs, or woody prickly climbers. *Leaves* large, abruptly bipinnate. *Flowers* showy, yellow, in copious axillary racemes. *Calyx* deeply cleft, with the disk confined to its base, the lobes imbricated, the lowest the largest, cucullate. *Petals* spreading, usually orbicular with a distinct claw, the uppermost smaller than the others. *Stamens* 10, free, declinate; *anthers* oblong, uniform, versatile. *Ovary* sessile or subsessile, few-ovuled; *style* filiform, sometimes clubbed at the tip; *stigma* terminal. *Pod* oblong or ligulate, thin and flat, or thicker and subturgid, indehiscent or dehiscent, smooth or (in subgenus *Guilandina*) armed all over with wiry spines. —Species about 40, widely spread in the tropics of both hemispheres.

Pod densely covered with flexible wiry prickles *1. C. Bonducella.*
Pod unarmed, glabrous . . . . . *2. C. sepiaria.*

1. C. Bonducella, *Flem. in As. Res. xi (1810), 159; Roxb. Fl. Ind. ii, 357; Brand. For. Fl. 156; F. B. I. ii., 254; Watt E. D.* Guilandina Bonduc, *W. & A. Prod. 280; Royle Ill. 184; D. & G. Bomb. Fl. 79 (in part).*—Vern. *Katkaranj.* (Fever-nut.)

A scandent shrub, with the branches petioles and rachis of inflorescence armed with short hard yellow prickles. *Leaves* 12-18 in. long; prickles on rachis and its branches recurved and usually in pairs; *stipules* (? reduced pinnæ) 2-fid; *pinnæ* 6-8 pairs; *leaflets* opposite, 6-10 pairs, ½ in. long, very shortly stalked, oblong, obtuse, mucronate, membranous, downy beneath. *Racemes* axillary, simple or panicled, denser towards the top; *pedicels* downy; *bracts* linear, recurved at the apex, and projecting beyond the buds, caducous. *Calyx* ½-⅓ in. long, rusty-tomentose. *Petals* twice the calyx, yellow, the upper one smaller and sometimes spotted with red. *Pod* 2-3 in., oblong, densely armed on the faces with sharp wiry prickles, dehiscent. *Seeds* 1 or 2, globose or ovoid, ¾ in. long, lead-coloured, shining.

A common plant over the greater portion of the area, especially in the neighbourhood of villages. DISTRIB. Throughout India and cosmopolitan in the tropics. Flowers during the rainy season. The root-bark, seeds and leaves are used medicinally. The seeds are very bitter, and are much used by the natives as a tonic and febrifuge. The hard nuts or seeds are made into bracelets, necklaces and rosaries.

2. C. sepiaria, *Roxb. Hort. Beng. 32; Fl. Ind. ii, 360; W. & A. Prod. 282; D. & G. Bomb. Fl. 80; Brand. For. Fl. 156; F. B. I. ii, 256; Watt E.D.*—Vern. *Uru, alai* (Dehra Dun), *aila* (Oudh).—Mysore thorn.

A large prickly climber, armed with short strong recurved pale-brown prickles. *Branches* downy. *Leaves* about 1 ft. long; *stipules* semi-sagittate, deciduous; *pinnæ* 6-10 pairs; *leaflets* opposite, 8-12 pairs, ⅝-¾ in. long, shortly stalked, oblong, obtuse, dark-green and glabrous above, glaucous beneath. *Racemes* about 1 ft. long, pedunculed, simple; *pedicels*

longer than the flowers, slender, ascending, jointed at the top; *bracts* lanceolate rusty-tomentose. *Flowers* deflexed. *Calyx* ½-¾ in. long, pubescent, lobes oblong or spathulate. *Petals* bright-yellow. *Stamens* exserted, filaments woolly towards the base. *Pods* pendulous, 3-5 in. long and about 1 in. wide, oblong, obliquely cuspidate, rather woody, glabrous, late in dehiscing. *Seeds* 4-8, ovoid, compressed, smooth, mottled brown and black.

Dehra Dun and in the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur, usually in swampy ground. DISTRIB. Warm valleys of the Outer W. Himalaya up to 6,000 ft., and throughout India to Ceylon extending to Burma, the Malay Penins., China and Japan. Flowers March to June The bark is much used for tanning in some places. It makes an excellent and impenetrable fence-plant.

C. Coriaria, Willd., is the Divi-divi or American sumach. It was introduced into India about 70 years ago. Its pods are very rich in tannin. For further particulars see Watt's Dictionary.—*C. pulcherrima*, Swartz, a large shrub with handsome orange and yellow flowers, is cultivated in gardens all over India. It is known as *krishna-chura* in Bengal. Its native country is not known for certain.

Poniciana regia, Bojer, a very handsome tree, indigenous in Madagascar, is cultivated in gardens over the greater part of India for the sake of its beautiful foliage and gorgeous scarlet and yellow flowers. *P. elata*, Linn., a small tree with handsome yellow flowers, is found wild in S. India and in Trop. Africa. It is planted near villages in the Merwára district of Rájputána, and the foliage is used as cattle fodder.

62. PARKINSONIA, Linn. ; Fl. Brit. Ind. ii, 260.

Spiny shrubs, or small trees. *Leaves* abruptly bipinnate; main *rachis* very short, secondary ones elongated; *leaflets* minute. *Flowers* yellow, in short racemes. *Calyx* deeply cleft, with a subbasal disk, the divisions lanceolate, subequal and slightly imbricate or valvate. *Petals* exserted, broad, the upper with a long claw. *Stamens* 10. included, villose; *anthers* versatile. *Ovary* short-stalked, many ovuled; *style* filiform; *stigma* terminal. *Pod* turgid, dry, moniliform, finally dehiscing. Species about 7, mostly Trop. American, one in S. Africa.

P. aculeata. *Linn. Sp. Pl. 375; W. & A. Prod. 284; F. B. I. ii, 260; Watt E. D.*—Vern. *Vilayati kikar.*

A glabrous shrub or small tree, armed with sharp woody spines, which represent the primary rachis of a bipinnate leaf and have 2-6 pinnæ congested in their axils. *Pinnæ* 6-12 in. long, the *rachis* much flattened, so that when the minute oblanceolate leaflets have fallen or are not developed they resemble the phyllodes of an *acacia*. *Racemes* lax, shorter than the leaves; *pedicels* slender, erecto-patent. *Corolla* about ½ in. long. *Pod* 3-4 in. long.

Largely grown as a hedge plant within the area and throughout India, and almost naturalized in many places. It is a native of Trop. America. The stems yield a fibre suitable for making into paper. The branches are lopped for fodder, and good charcoal is produced from the wood.

63. MEZONEURUM. Desf.; Fl. Brit. Ind. ii, 257.

Robust woody prickly climbers. *Leaves* abruptly bipinnate. *Flowers* in ample panicled racemes. *Calyx* very oblique, usually deeply cleft, with a basal or intertubal disk, the lobes imbricated, the lowest largest, covering the others in bud like a hood. *Petals* spreading, obovate-spathulate, subequal or the upper smallest. *Stamens* free, declinate, usually exserted; *anthers* oblong, uniform. *Ovary* sessile or shortly stipitate, declinate, few- or many-ovuled; *style* filiform; *stigma* small, capitate, the margin often fringed. *Pod* large, oblong, flat, thin, indehiscent, with a broad wing down the upper suture. *Seeds* compressed, orbicular.—Species about 15, inhabiting the tropics of the E. Hemisphere.

M. cucullatum, *W. & A. Prod. 283; D. & G. Bomb. Fl. 80; Brand. For. Fl. 155; F. B. I. ii, 253.* Cæsalpinia cucullata, *Roxb., Fl. Ind. ii, 355.*—Vern. *Biskoprah* (Oudh).

A large climber. *Branches* glabrous, armed with small dark recurved prickles. *Leaves* 6-12 in.; *pinnæ* 2-5 pairs; *leaflets* opposite, 4-5 pairs, ovate, acute, widely cuneate at the unequal base, rigidly subcoriaceous, dark-green and shining above. *Flowers* in simple or branched rigid racemes 4-8 in. long, arranged in terminal or axillary panicles 1-1½ ft. long; main *rachis* terete, glabrous; *pedicels* slender, jointed above the middle. *Calyx* deeply cleft, glabrous, yellow, leathery; anterior lobe ⅜ in., cucullate, obtuse, the others orbicular, tube shallow; *disk* basal. *Corolla* greenish, less than ½ in. across; *petals* suborbicular; *standard* 2-lobed, shorter but wider than the rest. *Stamens* exserted. ciliate at the base. *Ovary* 1-2-ovuled. *Pod* 3-4 in. long, and 1¼ in. wide (including wing), thin, faintly reticulated. *Seeds* usually solitary.

Forests of Dehra Dun and Oudh. DISTRIB. Outer Himalaya from Nepal eastward to the Khasia Hills, and from Chota Nagpur to W. and S. India; also in the Andamans. Flowers Nov.—Feb. Dr. Prain is inclined to refer the N. W. Indian examples to var. *grandis* F.B. I. l.c. (*Cæsalpinia grandis*, Heyne), which may indeed prove to be a distinct species.

64. PTEROLOBIUM, R. Br.; Brit. Ind. II, 259.

Robust woody prickly climbers. *Leaves* abruptly bipinnate. *Flowers* in panicled racemes. *Calyx* deeply cleft, with the disk near the base, the lobes imbricated, the lowest longer and more hooded than the others. *Petals* spreading, oblong, clawed, equalling

the calyx. *Stamens* 10, free, declinate, exserted; *anthers* oblong, versatile. *Ovary* sessile, 1-ovuled; *style* filiform; *stigma* small, terminal. *Pod* indehiscent, samaroid, with a large horny oblique terminal wing.—Species 7, inhabiting Trop. Asia, China, Australia and Africa

P. indicum, *A. Rich. Fl. Abyss. i., 246; F. B. I. ii, 259; Prain in Journ. As. Soc. Beng. LXVI (1897), part ii 473.* P. lacerans, *Wall. ; W. & A. Prod. 283.* Cæsalpinia lacerans, *Roxb. Fl. Ind. ii, 267.*

Branches slender, finely downy, armed with many strong recurved prickles. *Pinnæ* 4-8 pairs; *leaflets* 6-8 pairs, sessile, ½ in. long, obtuse, membranous, senitive, glabrous, pale-green; common petiole with usually a pair of prickles at the base; *rachis* with 2 recurved prickles on the underside between each pair of pinnæ, and a single incurved one on the upper. *Racemes* 2-3 in. long, from the axils of the terminal leaves only; *pedicels* ¾-1¼ in., spreading, finely downy. *Calyx* ⅛-¼ in., glabrous, lowest sepal longest. *Corolla* yellow, not showy, as long as the lowest sepal. *Stamens* bearded below. *Pod* 1¼-1½ in. including the large membranous obliquely terminal wing.

Dehra Dun (King). DISTRIB. S. India.

Suborder III.—Mimoseæ.

Trees or shrubs, rarely herbs. *Leaves* 2-pinnate, rarely simply pinnate. *Flowers* small, regular, usually in globose heads or cylindric spikes, 2-sexual, or rarely polygamous. *Sepals* valvate, usually connate in a 5-lobed tube. *Petals* 5, valvate, usually connate below. *Stamens* definite or indefinite, free or 1-adelphous, usually exserted; *anthers* versatile. *Ovary* free at the base of the calyx. *Seeds* usually albuminous.

Stamens definite.
- Anthers gland-tipped (Tribe XIII. ADENANTHEREÆ).
  - Herbs with flowers in small heads — 65. NEPTUNIA.
  - Trees or shrubs, flowers in racemes or spikes.
    - Flowers in panicled racemes.
      - A large unarmed tree — 66. ADENANTHERA.
    - Flowers in cylindrical spikes.
      - Thorny trees or shrubs.
        - Flowers all 2-sexual.
          - Pod dehiscent. A tree armed with conical prickles — 67. PIPTADENIA.

Pod indehiscent. A small thorny tree	68. PROSOPIS.
Upper flowers of spikes ♂-sexual, the lower neuter	69. DICHROSTACHYS.
Anthers not gland-tipped (Tribe XIV. EUMIMOSEÆ).	
Pod continuous, opening through the sutures	70. LEUCÆNA.
Pod with separating joints, sutures persistent	71. MIMOSA.
Stamens indefinite.	
Filaments free (Tribe XV. ACACIEÆ)	72. ACACIA.
Filaments united (Tribe XVI. INGEÆ)	73. ALBIZZIA.

65. NEPTUNIA, Lour.; Fl. Brit. Ind. ii, 285.

Herbs without prickles. *Leaves* bipinnate, with persistent stipules and numerous small strap-shaped sensitive membranous leaflets. *Flowers* minute, dimorphous in dense heads on axillary peduncles, polygamous, those of the lower part of the head bearing only protruded flattened staminodes. *Calyx* minute, campanulate, 5-toothed. *Petals* 5, strap-shaped, connate near the base. *Stamens* of the perfect flowers exserted; *anthers* gland-crested. *Ovary* stalked, many-ovuled; *style* filiform; *stigma* club-shaped. *Pod* coriaceous, flattened, ligulate or oblong, 2-valved.—Species 8, cosmopolitan in the tropics.

Stems prostrate, sterile flowers numerous	*1. N. oleracea.*
Stems ascending, sterile flowers few or 0	*2. N. triquetra.*

1. N. oleracea, *Lour. Fl. Cochin., 654; D. & G. Bomb. Fl. 84; F. B. I. ii, 285; Watt E.D.* Mimosa natans, *Roxb.; Fl. Ind. ii, 553.* Desmanthus natans, *Willd.; W. & A. Prod. 270.* Vern. *Laj-álu.*

An aquatic herb, with stout widely creeping or floating stems rooting at the nodes rarely emitting suberect branches. *Pinnæ* 4-6, 2-3 in. long; *rachis* without glands; *stipules* obliquely cordate; *leaflets* 8-15 pairs, ½-¼ in. long, narrowly oblong, obtuse, glabrous. *Peduncles* ascending, 8-12 in., glabrous; *bracts* small, ovate, subobtuse. *Flowers* minute, in dense heads, the lower replaced by numerous ligulate yellow staminodes. *Pod* ½-1 in., obliquely oblong, beaked, dehiscing early by the upper suture, 6-8-seeded.

In swamps and slow-flowing streams. DISTRIB. Throughout India, and in Ceylon and the Malay Penins.; cosmopolitan in the tropics.

Flowers during the rains and the cold season. The plant is used as a potherb.

2. N. triquetra. *Benth. in Hook. Journ. Bot. iv, 355; D. & G. Bomb. Fl. 84; F. B. I. ii, 286.* Mimosa triquetra, *Vahl; Roxb.; Fl. Ind. ii, 552.* Desmanthus triquetrus, *Willd.; W. & A. Prod. 270.*

A low diffuse perennial herb with slender ascending angular stems *Pinnæ* 2-6, an inch or less long, with a gland on the rachis between the lowest pair; *stipules* subulate; *leaflets* 14-15 pairs, ¼-½ in. long, linear-oblong, subacute, ciliate at the edges. *Flowers* minute, in small globose heads; *peduncles* solitary, usually with 2 caducous bracts near the middle. Sterile flowers few or 0. *Pod.* ½-1 in., stalked, oblong, very shortly beaked, 4-6-seeded, valves membranous.

Bundelkhand (Edgeworth). DISTRIB. Central Prov. and S. India.

N. plena, *Benth.*, a native of Trop. America, is mentioned in the Fl. Brit. India as having been introduced into the N. W. Provinces. It occurs also in Bengal, and is described by Roxburgh under the name of *Mimosa Adenanthera*. It closely resembles *N. oleracea*, but has a very much longer pod.

66. ADENANTHERA, Linn.; Fl. Brit. Ind. 287.

Erect trees without spines or tendrils. *Leaves* ample, bipinnate. *Flowers* minute, in narrow spike-like panicled racemes, hermaphrodite, usually 5-merous. *Calyx* campanulate, equally toothed. *Petals* valvate, equal, lanceolate, cohering only at the very base. *Stamens* 10, free, equalling the corolla; *anthers* tipped with a gland. *Ovary* sessile, many-ovuled; *style* filiform; *stigma* minute, capitate. *Pod* strap-shaped, torulose, falcate, the coriaceous valves much twisted after they separate. *Seeds* small, bright-coloured.—Species 4, inhabiting the tropics of the Old World.

A. pavonina, *Linn. Sp. Pl. 384; Roxb. Fl. Ind. ii, 370; W. & A. Prod. 271; Royle Ill. 185; Brand. For. Fl. 168; F. B. I. ii, 287; Watt E.D.*

An unarmed tree with rough dark-coloured bark. *Leaves* 1-3 ft. long; *petiole* 2-4 in.; *pinnæ* opposite, 4-6 pairs, 4-12 in. long; *leaflets* alternate, 4-8 pairs, ¾-1½ in. long, oval or oblong, dark-green above, glaucous beneath, glabrous on both surfaces. *Racemes* spike-like, short-peduncled, 2-6 in. long, terminal and from the axils of the upper leaves; *bracts* minute, caducous. *Calyx-lobes* very small. *Corolla* pale-yellow, with narrow-lanceolate equal petals. *Pod* 6-9 in., ligulate, falcate, contorted when ripe. *Seeds* 10-12, lenticular, usually bright scarlet, smooth and shining.

Forests of Gorakhpur (Duthie's collector). DISTRIB. Sikkim Himalayas up to 4,000 ft., Bengal, Burma, S. India, Ceylon, Malay Penins. and Islands; also in China and the Philippines. Flowers March-May. The red close-grained heartwood is valued in S. India for cabinet-making. Pounded into a paste by rubbing on a moist stone, it is used by Brahmins for colouring the forehead. This tree must not, however,

be confounded with the much more valuable *Red Sanders tree* (Pterocarpus santalinus), the wood of which is also used for this purpose. The scarlet seeds are used as weights, and are often made into necklaces.

67. PIPTADENIA, Benth.; Fl. Brit, Ind. ii, 289.

Erect trees, unarmed or prickly. *Leaves* bipinnate. *Flowers* small, in dense spikes, hermaphrodite, 5-merous. *Calyx* campanulate, shortly 5-toothed. *Petals* 5, valvate, equal, lanceolate, cohering at the base. *Stamens* 10, free, as long as the corolla; *anthers* tipped with a deciduous gland. *Ovary* stalked, many-ovuled; *style*-filiform; *stigma* terminal. *Pod* long, thin, strap-shaped, flat. *Seeds* brown, compressed.—Species about 40, all of which, except the single Indian representative and one in New Guinea, inhabit tropical regions of America and Africa.

P. oudhensis, *Brand. For. Fl. 168; F. B. I. ii, 289; Duthie in Ann. R. Bot. Gard. Calc. ix, 33, t. 43.* Adenanthera oudhensis, *J. L. Stewart, Mss.*—Vern. *Genti, gainti* (Oudh).

A small tree, glabrous except the inflorescence; *bark* greyish or reddish-brown, rough with flat exfoliating woody scales; inner bark red, fibrous. *Branches* armed with large compressed conical prickles; branchlets drooping. *Leaves* abruptly bipinnate; *pinnæ* 4, on long stalks, each of a single pair of leaflets, primary and secondary petioles with a large flat circular gland at the base of each pair of pinnæ; *leaflets* 2-4 in. long and 1½-3½ in. broad, ovate-rhomboid or reniform, entire, subcoriaceous; veins prominent on both surfaces, anastomosing and forming loops within the margin. *Flowers* minute, greenish-yellow, in dense cylindric spikes 1-3 in. long and arranged in axillary panicles shorter than the leaves. *Calyx* campanulate, with 5 shallow teeth. *Petals* thrice the calyx, lanceolate, fleshy. *Stamens* free, slightly exserted, *filaments* attached to the outer basal edge of an annular disk; *anthers* dorsifixed, broadly oval, terminal glands globose. *Ovary* stalked; *style* filiform, overtopping the stamens. *Pod* stalked, 8-12 in. long, and about ½ in. broad. *Seeds* 15-20, compressed, brown.

On the banks of streams in the northern and hilly portion of the Gonda district in Oudh (R. Thompson, and Inayat Khán), also found in the Kumaon Terai by Mr. A. F. Broun. Flowers in April. This very local tree was first discovered in 1871 by Mr. Richard Thompson. Inayat Khán, who found the tree growing abundantly within the Nepal territory, states that the characteristic broad-based prickles occur only on the branches. The largest trunk seen by him measured only 3½ ft. in circumference.

68. PROSOPIS, Linn.; Fl. Brit. Ind. ii, 287.

Erect trees or shrubs with scattered prickles. *Leaves* bipinnate, with small narrow leaflets. *Flowers* minute, in narrow spikes or

subspicate racemes, polygamous. *Calyx* minute, campanulate, subentire or faintly 5-toothed. *Petals* 5, ligulate, subcoherent at the base. *Stamens* 10, free, slightly exserted; *filaments* filiform; *anthers* crowned with a gland. *Ovary* stalked, many-ovuled; *style* filiform; *stigma* minute, terminal. *Pod* turgid, indehiscent, cylindric or oblong, with a thick spongy mesocarp, septate between the seeds.—Species about 25, inhabiting tropical and subtropical regions of both hemispheres.

P. spicigera, *Linn. Mant. i, 68; W. & A. Prod. 271; Royle Ill. 182; D. & G. Bomb. Fl. 84; Brand. For. Fl. 169; t. xxv; F. B. I. ii, 288; Watt E. D.* Adenanthera aculeata, *Roxb. Fl. Ind. ii, 371.*—Vern. *Jhand, chaunkra.*

A moderate-sized tree, more or less armed with scattered broad conical somewhat compressed nearly straight prickles. *Pinnæ* usually 4, opposite, 1-2 in. long, with a gland between each pair; *leaflets* 8-12 pairs, sessile ¼-½ in. long, obliquely oblong, cuspidate, rigidly coriaceous, grey, glabrous. *Flowers* small, yellow, in slender spikes 2-3 in. long, arranged in short-pedunculed axillary panicles. *Pod* 5-10 in. long, pendulous, torulose. *Seeds* many, immersed in sweetish mealy pulp, oblong, brown.

Not uncommon in the drier portions of the area, as in Merwára, Bundelkhand and in the neighbourhood of Delhi and Agra. DISTRIB. Abundant in the Punjab, Rajputana, Sind and Gujarat, also in the drier parts of C. and S. India; it occurs also in Baluchistan, Afghanistan, and Persia. Flowers in April and May. The sweetish pulp inside the young pods resembles that of the *Carob* (Ceratonia Siliqua), and is largely eaten in times of scarcity in localities where the tree is abundant. The bark, which has a sweetish taste, is also largely consumed in the form of flour during severe famines. The purplish-brown heartwood is very hard and tough, but not durable; the wood, however, is chiefly valued as fuel. The tree is considered sacred by Hindus all over India. For further information Dr. Watt's Dictionary article should be consulted.

P. juliflora, DC. the *Mezquit Bean* of Texas, has been successfully grown at Saharanpur and at other places within the area of this flora. The sweet pods of this tree are largely used as food and as fodder for cattle in its native country.

69. DICHROSTACHYS, DC.; Fl. Brit. Ind. ii, 288.

Shrubs or small trees. *Leaves* bipinnate, with minute coriaceous leaflets. *Flowers* minute, spicate, dimorphous, polygamous, only perfect in the upper part of the spike, those of the lower half bearing long filiform staminodes. *Calyx* minute, companulate, 5-toothed. *Corolla* oblong, the 5 strap-shaped petals subconnate towards the base. *Stamens* of the perfect flowers slightly exserted; filaments

filiform, free; anthers gland-crested. *Ovary* sessile, many-ovuled; style filiform; stigma capitate. *Pod* small, strap-shaped, coriaceous, subarticulated, continuous within, twisted up when mature, dehiscing irregularly.—Species 7, inhabiting the tropical regions of the Old World.

D. cinerea, *W. & A. Prod. 271; D. & G. Bomb. Fl. 84; Brand. For. Fl. 171; F. B. I. ii, 288; Watt E. D.* Mimosa cinerea, *Linn.; Roxb.; Fl. Ind. ii. 561.* Desmanthus cinereus, *Willd.; Royle Ill. 182.*—Vern. *Kunlai* (Merwára).

A much branched rigid thorny shrub or small tree, with copious spreading pubescent branchlets ending in spines. Bark white or grey. *Leaves* 1-2 in. long; *pinnæ* 8-10 pairs, with stipitate glands at the base of each pair; *leaflets* 12-15 pairs, minute, sessile, ligulate, coriaceous, ciliate. *Spikes* 1-2 in. long, axillary, shortly stalked. *Flowers* minute; upper fertile, yellow; lower sterile, with white purple or rose-coloured staminodes. *Pod* 2-3 in. long, twisted, irregularly dehiscent.

Fattehgarh on the Ganges, Delhi, Bundelkhand and Merwára, in dry usually rocky places. DISTRIB. C. and S. India to Ceylon; also in the Malay Islands and in N. Australia. Flowers during the hot season. The wood is extremely hard and is valued for tent pegs.

70. LEUCÆNA, Benth.; Fl. Brit Ind. ii, 290.

Unarmed erect trees or shrubs. *Leaves* bipinnate. *Flowers* sessile, in dense globose heads, 5-merous, usually perfect. *Calyx* cylindrical-campanulate, shortly-toothed. *Petals* valvate, free. *Stamens* 10, free, much exserted; *anthers* not gland-crested. *Ovary* stalked, many-ovuled; *style* filiform; *stigma* minute, terminal. *Pod* flat, coriaceous, strap-shaped, dehiscent, not jointed.—Species 8, mostly American.

L. glauca, *Benth. in Hook. Journ. Bot. iv, (1842), 416; Brandis For. Fl. 172; F. B. I. ii, 290; Watt E. D.* Acacia frondosa, *Willd.; W. & A. Prod. 275.*

A shrub or small tree with large 2-pinnate leaves; *pinnæ* 4-8 pairs; *leaflets* 10-15 pairs, ⅓-½ in. long, linear, acute, membranous, finely downy. *Peduncles* axillary, solitary or in pairs, as long as the petiole, bearing a dense globular head of flowers. *Corolla* ⅛ in., whitish. *Stamens* twice as long as the corolla; *anthers* versatile. *Pod* 5-6 in., clustered in umbels, straight, linear, flat, shining, many-seeded.

Introduced into India, and probably indigenous only in tropical America. It is planted in gardens in many parts of India, and is becoming naturalized in some places. Brandis mentions it as being common in the outer valleys of Garhwal and Kumaon. Flowers June to August.

71. MIMOSA, Linn.; Fl. Brit. Ind. ii, 291.

Shrubs or herbs, with or without prickles. *Leaves* (in the Upper Gangetic species) bipinnate; *leaflets* small, sensitive, ligulate, caducous. *Flowers* minute, in dense globose heads, polygamous, mostly 4-merous in the Indian species. *Calyx* campanulate, shortly-toothed. *Petals* connate towards the base. *Stamens* as many as or twice the number of the petals; *filaments* filiform, free; *anthers* not gland-crested. *Ovary* stalked, many-ovuled; *style* filiform; *stigma* minute, terminal. *Pod* flat, membranous, made up of 1-seeded joints that separate when mature from the sutures.—Species over 200, mostly confined to Trop. America.

Pinnæ digitately arranged, stamens 4	*1. M. pudica.*
Pinnæ pinnately arranged, stamens 8-10.	
Pinnæ 4-12 pairs, pod usually not prickly	*3. M. rubicaulis.*
Pinnæ 3-4 pairs, pod with prickly sutures	*3. M. hamata.*

1. M. pudica, *Linn. Sp. Pl. 518; Roxb. Fl. Ind. ii, 564; F. B. I. ii, 291 Watt E.D.; Prain in Journ. As. Soc. Beng. LXVI, 506.*—Vern. *Lajwanti* (The Sensitive Plant.)

A widely spreading diffuse undershrub. *Stems* and *branches* prickly and densely clothed with deflexed bristles. *Leaves* very sensitive; *rachis* beset with ascending bristles; *stipules* lanceolate, striate, margins bristly; *pinnæ* usually 4, 2½-3½ in. long, sessile at the end of the petiole; *leaflets* 12-20 pairs, ¼ in. long, sessile, obliquely narrow-oblong, acute, subcoriaceous, glabrous above, appressed-bristly beneath. *Heads* usually in pairs, ½ in. in diam.; *peduncles* slender, ¾-1 in. long, beset with spreading bristles. *Stamens* 4. *Pod* ¾-1 in. long, flat, membranous; joints 3-5, falling away when ripe from the sutures which are armed with weak spreading yellowish bristles.

Dehra Dun, and in the Sub-Himalayan tracts eastward, naturalized as a weed in waste land; often cultivated. DISTRIB. Throughout the hotter parts of India, and cosmopolitan in the tropics. It is said to be a native of Brazil. The root and leaves are used medicinally.

2 M. rubicaulis, *Lamk. Encycl. i, 20; W. & A. Prod. 268; Royle Ill. 181; D. & G. Bomb Fl. 85; Brand. For. Fl. 172; F. B. I. ii, 291; Watt E.D.* M. octandra, *Roxb.; Fl. Ind. ii, 564.* M. mutabilis. *Roxb. Fl. Ind. l.c.*—Vern. *Shiah kanta, kingrei, álay* (Dehra Dun). *ál* (Saharanpur).

A large straggling prickly shrub. *Branches* reddish when young, slender, grooved finely dowdy, tthickly beset with short recurved prickles. *Leaves* 6-9 in., with a prickly rachis; *stipules* subulate; *pinnæ* 4-12 pairs, with a bristle-like gland between each pair, 1-2 in. long, usually opposite; *leaflets* 10-12 pairs, about ¼ in. long, obliquely linear-oblong, obtuse, obliquely cuspidate, membranous, appressed-pubescent. *Peduncles* 1-2 in., solitary or fascicled in the axils of the upper leaves

Flowers 4-merous, red turning to white. *Corolla* very small. *Stamens* 8-10. *Pod* 3-5 in. long linear-oblong, curved, glabrous, 6-10-seeded; *joints* square, separating from the sutures which are usually not prickly.

Common within the area, in open grassy places, in water-courses and along the banks of rivers. DISTRIB. Throughout India, ascending to 5,000 ft. on the outer Himalaya; also in Afghanistan. Flowers from July to September. The leaves and seeds are used medicinally, and gun-powder charcoal is prepared from the wood. It is an excellent plant for hedges.

3. **M hamata**. *Willd. Sp. Pl. iv, 1033; W. & A. Prod. 268; D. & G. Bomb. Fl. 85; F. B. I. ii, 291.*

Closely allied to *M. rubicaulis* as to habit and inflorescence. *Pinnæ* 3-4 pairs; *leaflets* 6-10 pairs, minute, linear-oval, pubesent. *Peduncles* longer than the leaves. *Pod* stalked, linear, curved, pubescent, 3-7-jointed, the sutures and stalk armed with large hooked prickles.

Bundelkhand and Merwara. DISTRIB. Punjab, C. and S. India.

72. ACACIA. Willd.; Fl. Brit. Ind. ii, 252.

Spinose or prickly shrubs or trees, erect or climbing. *Leaves* bipinnate, with minute leaflets. *Flowers* in globose heads or cylindrical spikes, hermaphrodite or polygamous, usually 5-merous. *Calyx* campanulate or funnel-shaped, shortly toothed. *Petals* exserted, united in the lower half. *Stamens* free, indefinite, much exserted; *anthers* minute, not gland-crested. *Ovary* stalked or sessile, many-ovuled; *style* filiform; *stigma* minute, capitate. *Pod* ligulate or oblong, not jointed, usually compressed and dry, dehiscent or indehiscent, rarely turgid or subcylindric, *sutures* straight or wavy, not thickened.—Species about 430. The leafy groups are cosmopolitan in the tropics; whilst the phyllodineous series, comprising about two-thirds of the species, is almost restricted to Australia.

Trees or erect shrubs with stipular spines or prickles.

Flowers in globose heads, spines long, straight.
Heads axillary, fascicled.
Pod thick, cylindrical; seeds in a double row . . . . . 1. *A. Farnesiana.*
Pod flat, momiliform, persistently grey-downy . . . . . 2. *A. arabica.*
Pod flat, not moniliform. Leaflets 6-8 pairs, glabrous or nearly so.
Pod narrowly ligulate, with repand sutures . . . . . 3. *A. eburnea.*

Pod broadly ligulate, sutures not repand	4. *A. Jacquemontii.*
Leaflets 15-30 pairs, tomentose on both sides	5. *A. tomentosa.*
Heads in terminal panicles . . .	6. *A. leucophlœa.*
Flowers in peduncled spikes; prickles short, hooked.	
Pod dehiscent	7. *A. Catechu.*
Pod indehiscent.	
Stipular prickles 3, pinnæ 3-5 pairs .	8. *A. Senegal.*
Stipular prickles 2, pinnæ 2-3 pairs .	9. *A. modesta.*
Climbing shrubs with scattered prickles, flowers in panicled globose heads.	
Pod thick, indehiscent	10. *A. concinna.*
Pod thin, flat, dehiscent.	
Leaflets 8-12 pairs, glabrous on both surfaces	11. *A. Intsia.*
Leaflets 20-30 pairs, crowded, always hairy beneath	12. *A. cæsia.*
Leaflets 40-50 pairs, crowded, very narrow, glabrous on both surfaces .	13. *A. pennata.*

1. A. Farnesiana, *Willd. Sp. Pl. iv, 1083; Royle Ill. 181; Brand. For. Fl. 180; F.B.I. ii, 292; Watt E.D.* Mimosa Farnesiana, *Linn.; Roxb.; Fl. Ind. ii, 557.* Vachellia Farnesiana, *W. & A. Prod. 272.*—Vern. *Valayati kikar.*

A shrub or small tree, with slender zigzag branches marked with grey dots. *Stipular spines* ¼-½ in. long, persisting and lengthening on the older branches, straight, white and polished. *Rachis* of leaves 1-1½ in., with a minute petiolar gland, downy; *pinnæ* 4-8 pairs, 1-1½ in.; *leaflets* 10-20 pairs, ¼ in. long, linear-oblong, rigidly coriaceous, subglabrous, green. *Peduncles* crowded on axillary nodes, slender, puberulous, with a ring of bracts near the apex. *Flowers* in heads, bright-yellow, fragrant. *Calyx* very minute; teeth short, obtuse. *Pod* 2-3 in. long, thick, cylindrical, dull-brown, horizontally striate, *sutures* straight. *Seeds* 2-seriate, mesocarp pulpy.

Abundant within the area, both cultivated and naturalized, also throughout India and in the tropics generally. Indigenous in Trop. America. Flowers Jan.—March. The delicious perfume obtained from the blossoms by distillation is in great demand, and the plant is largely grown for this purpose in the south of France. The tree also yields a very high-class gum, superior in some respects to *gum-arabic.* It makes a good hedge.

2. A. arabica, *Willd. Sp. Pl. iv, 1085; W. & A. Prod. 277; Royle Ill. 182; D. & G. Bomb. Fl. 86; Brand. For. Fl. 180; F. B. I. ii, 293; Watt E.D.* Mimosa arabica, *Roxb.; Fl. Ind. ii, 557.*—Vern. *Babul, kikar.*

A medium-sized evergreen tree with dark-brown bark. *Branchlets* finely grey-downy. *Spines* ¼-2 in. long, straight, pungent, turning white on the older branches. *Leaves* 1-2 in. long; *rachis* downy, with several glands; *pinnæ* 3-6 pairs, ½-1½ in. long; *leaflets* 10-20 pairs, ¼-⅓ in. long, membranous, glabrous or downy. *Peduncles* short, 4-6-nate, densely grey-downy, with bracts above the middle. *Heads* ½ in. in diam. *Flowers* yellow, fragrant. *Calyx* minute, campanulate. *Corolla* twice the calyx. *Pods* usually solitary, 3-6 in. long, distinctly stalked, rather fleshy; *sutures* deeply indented between the seeds, subindehiscent, densely and persistently grey-downy. *Seeds* 8-12, in a single row.

Common within the area, but only as a planted tree or self-sown. DISTRIB. Throughout the greater part of India and in Ceylon, but nearly always planted. According to Brandis the tree is probably indigenous in Sind, and perhaps in the N. Deccan. It is found also in Arabia, Egypt and in Trop. Africa. It flowers during the rains, and the pods ripen in the cold season. The young pods and foliage are greedily eaten by all kinds of cattle, as well as by camels; and as such fodder is of immense value during seasons of drought, every encouragement should be given towards extending the growth of this tree in such lands where agricultural crops cannot be grown with profit. For a full account of the many useful products yielded by this valuable tree, far too numerous to be mentioned here, Dr. Watt's Dictionary article should be consulted.

3. A. eburnea, *Willd. Sp. Pl. iv, 1081; W. & A. Prod. 276; D. & G. Bomb. Fl. 85; Brand. For. Fl. 183; F. B. I. ii, 293; Watt E.D.*—Vern *Pahari-kikar* (Saharanpur), *kikar* (Dehra Dun).

A shrub or small tree, with dark-grey or reddish-brown bark. *Spines* ¼-2 in. long, straight, dark-brown, becoming white. *Leaves* 1-1½ in. with a gland between each of the two lowest pairs; *leaflets* 6-12 pairs, ⅛-¼ in. long, rigidly coriaceous, greyish-green. *Heads* less than ½ in. in diam.; *peduncles* about 1 in., filiform, grey-downy, with an involucre of connate bracts about the middle. *Calyx* minute, funnel-shaped, teeth short. *Corolla* hardly twice the calyx, pale-yellow. *Pod* 3-6 in. long, thin, flat, straight, dehiscent, narrowly ligulate, coriaceous, glabrous, shining, sutures slightly indented. *Seeds* 6-10, in a single row.

Common in Dehra Dun and on the Siwalik range. DISTRIB. Throughout the greater part of India and in Ceylon; also in Afghanistan and Arabia. Flowers during the cold season.

4. A. Jacquemontii, *Benth. in Hook. Journ. Bot. i (1842), 499; Brand. For. Fl. 183; F. B. I. ii, 293; Watt E.D.*—Vern. *Baonli* (Merwára).

A glabrous shrub, with stiff flexuose brown branchlets. *Spines* slender, straight, 1½-2 in., connate at the base, ivory-white; *pinnæ* 3-4 pairs, ¼-½ in. long; *petiole* 1-2 in.; *leaflets* 6-10 pairs, linear-oblong, greyish-green, nearly glabrous, rigidly coriaceous. *Peduncles* fascicled; *heads* ¼ in.

in diam. fragrant. *Corolla* twice as long as calyx. *Pod* 2-3 in., distinctly stalked, straight, thin, flat, broadly ligulate, glabrous, grey, dehiscent; *sutures* not indented. *Seeds* 5-6, in a single row.

In ravines and dry water-courses in the districts of Agra and Merwára. DISTRIB. Plains of Punjab, ascending to 3,000 ft. on the outer Himalaya, Sind, Rajputana, Gujarat, and in the C. Provinces in the rocky beds of rivers. Flowers Feb.-May. The bark yields a gum, and it is also used in tanning. The leaves are stored as fodder. It would make an excellent and handsome hedge-plant.

5. A. tomentosa. *Willd. Sp. Pl. iv, 1087; W. & A. Prod. 276; D. & G. Bomb. Fl. 86; F. B. I. ii, 294; Watt E. D.* Mimosa tomentosa, *Roxb.; Fl. Ind. ii, 558.*

A small tree with yellowish-grey bark. *Branchlets* and *leaf-rachises* densely grey-pubescent. *Spines* straight, up to ⅝ in. long, broad-based, pubescent when young, becoming glabrous and nearly black. *Leaves* evenly 2-pinnate; *rachis* with an oblong gland below the lowest pair of pinnæ, and smaller ones between 1 or 2 of the upper; *pinnæ* 6-12 pairs, 1-2 in. long; *leaflets* 15-30 pairs, ⅛-⅓ in. long, broadly oblong, membranous or subcoriaceous, tomentose on both sides. *Heads* about ¼ in. across, arranged in terminal panicles; *peduncles* stout, pubescent, bracteate about the middle. *Flowers* white. *Corolla* twice the calyx. *Pod* 4-6 in. long, ligulate-falcate, thin, dry, dehiscent, with straight sutures, grey-downy, 6-10-seeded.

Bundelkhand (Mrs. Bell). DISTRIB. Bengal to S. India and Ceylon; also in Java. Flowers about the beginning of the cold season.

6. A. leucophlœa. *Willd. Sp. Pl. iv, 1093; W. & A. Prod. 277; Royle, Ill. 182; D. & G. Bomb. Fl. 86; Brand. For. Fl. 184. t. xxvii; F. B. I. ii, 294; Watt E. D.*—Vern. *Safed kikar, reru, rawng, arinj, karir, nimbar, jhind.*

A medium-sized grey-tomentose thorny tree. *Spines* ½-1 in. long, strong, straight, white. *Leaf-rachis* downy; *pinnæ* 6-12 pairs, 1-1½ in. long; glands small, cup-shaped; *leaflets* 15—30 pairs, crowded, ⅓-½ in. long, linear, rigidly coriaceous. *Heads* about ¼ in. in diam., in large terminal panicles a foot long or more; *bracts* 2, at about the middle of each pedicel. *Corolla* very small, pale-yellow or almost white. *Pod* 4-6 in. long, narrowly ligulate, curved, subindehiscent, clothed with persistent pale-brown or grey tomentum, 8-12-seeded, sutures not indented.

Abundant in the drier parts of the Doab, also in Rohilkhand, Bundelkhand and Merwára. DISTRIB. Punjab, Rajputana, C. India and south to Ceylon; also in Burma and in the Malay Islands. Flowers during the hot and rainy seasons. Brandis mentions that on the dry hills of Merwára it is often reduced to a mere shrub, with 2-4 pairs of pinnæ and 8-10 pairs of leaflets; whilst in the Punjab it has been known to attain a height of 80 ft. and girth of 15 ft. The gum yielded by this plant is used in native medicines, and the leaves and bark are used in dyeing; the fibre obtained from the bark is made into ropes and fishing-nets; the young pods and seeds, and even the pounded bark mixed with flour,

are eaten in times of scarcity. The wood is used chiefly for posts and fuel. The reddish-brown heartwood is extremely hard, strong and tough, but it is liable to split in the form of planks. The bark, which contains much tannin, is largely used in S. India in the preparation of spirits from sugar and palm-juice.

7. A. Catechu, *Willd. Sp. Pl. iv, 1079; Royle Ill. 181; Brand. For. Fl. 186 (in part); F. B. I. ii, 295; Watt E. D.; Prain in Journ. As. Soc. Beng. LXVI, part ii, 508.*—Vern. *Khair.* (Kutch).

A moderate-sized tree, with thorny branches and rough dark-coloured bark. *Branchlets* glabrous, shining. *Stipular spines* in pairs, short, recurved, dark-coloured, shining. *Petiole* 3-4 in., often prickly. *Rachis* of leaves prickly and downy, with one gland below the lowest pair of pinnæ and at the insertions of the 3 uppermost pairs; *pinnæ* 20-40 pairs; *leaflets* 30-50 pairs, less than ¼ in. long, linear. *Spikes* cylindrical, 2-4 in., solitary or fascicled. *Flowers* sessile, pale-yellow. *Corolla* hairy, 2-3 times longer than the tomentose calyx. *Pod* 2-3 in., stalked, straight, flat, dehiscent, dark-brown, shining, 5-6-seeded.

Dehra Dun and Siwalik range, N. Oudh (Duthie's collector), Guna (King), Gwalior (Maries), Saugor (Vicary), Bundelkhand (Edgeworth). DISTRIB. Punjab at Hoshiarpur, and up to 3,000 ft. on the Outer Himalaya, from Hazara to Garhwal, becoming scarce eastward to Bengal and rare in Burma. Flowers May-July. The wood of this tree is much valued for its hardness and durability, as well as from the fact of its being proof against the attacks of white-ants. It is used for rice-pestles, ploughs and for various other purposes for which such a wood is suitable. Charcoal prepared from it is considered to be the best for blacksmith's work. The most important product, however, of this tree is the resinous extract known as *catechu* or *kutch*, which is obtained by repeatedly boiling chips of the heartwood in water until the solution acquires the consistency of a thick paste. Full particulars regarding the three distinct forms of *catechu* extract, their preparation, and the uses to which they are applied, will be found in Dr. Watt's Dictionary article. The pale kind of *kutch*, known as *kath*, is that which is eaten in pán, and used also medicinally by the Hindus. This tree yields also a superior pale-yellow gum, which is largely collected.

VAR. Sundra. A. Sundra, *DC. Prod. ii, 458; W. & A. Prod. 273; D. & G. Bomb. Fl. 86; F. B. I. ii, 295; Watt E. D.; Prain in Journ. As. Soc. Beng. l.c.* A. Catechu, *Brand. For. Fl. 186 (in part).* Mimosa Sundra, *Roxb.; Fl. Ind. ii, 562.*—Vern. *Lál khair. Pinnæ* 15—20 pairs; *rachis* glabrous; *leaflets* 20—40 pairs. *Calyx* and *corolla* glabrous.—Merwára (Duthie). DISTRIB. Kathiawar, Mt. Abu in Rajputana (King), extending to S. India and Burma. The third form of *khair* (A. catechuoides, Benth.) is not found within the area of this flora. Botanically this latter may be regarded as intermediate between A. Catechu, *Willd.*, and A. Sundra, *DC.*, having the hairy leaf rachis of the former and the glabrous calyx and corolla of the latter. In accordance with the views of Roxburgh, Baker and Prain they may each be considered as forms of *khair*

occupying 3 distinct areas, *A. Catechu* predominating in N. W. India, *A. catechuoides*, the Bengal, Assam and Burma form, and *A. Sundra*, the characteristic form of W. and S. India.

8. A. Senegal, *Willd. Sp. Pl. iv, 1077; F. B. I. ii, 295; Watt E. D.* A. rupestris, *Stocks; Brand. For. Fl. 184.*—Vern. *Kumpta* (Merwára).

A small thorny tree 6-12 ft. high, with flexuose glaucous branches. *Leaf-rachis* about one inch long, with one gland at the base and one between the upper pairs of pinnæ, finely downy; *stipular spines* usually in threes, small, hooked, or the 2 lateral ones straght, polished and black; *pinnæ* 3-5 pairs; *leaflets* 8-14 pairs, ¼ in. long, linear-oblong, rigidly coriaceous, glabrous, greyish-green. *Spikes* 2-3 in. long, exceeding the leaves, lax, cylindrical. *Calyx* campanulate, glabrous; teeth deltoid, acute. *Corolla* twice the calyx, white. *Filaments* yellow. *Pod* 3 in. long, ⅝ in. broad, stalked, ligulate, straight, thin, firm, grey, somewhat constricted between the 4-6 seeds, indehiscent.

Merwára. DISTRIB. Rohtak in the Punjab, abundant in Sind and Rajputana; also in Arabia and Trop. Africa. Flowers during the cold season. The hard light-yellow wood takes a beautiful polish, and is used for weaver's shuttles. A very superior gum is collected from this tree, but as it is nearly always mixed with other kinds of gum, its good quality in the market is not recognized.

9. A modesta, *Wall. Pl. As. Rar. ii, 27, t. 130; Dene in Jacquem. Voy. Bot. i, 56; Royle Ill. 182; Brand. For. Fl. 185; F. B. I. ii, 296; Watt E. D.* Mimosa dumosa, *Roxb. Fl. Ind. ii, 559.* M. obovata, *Roxb. Fl. Ind. ii, 561.*—Vern. *Phuláhi.*

A medium-sized thorny tree, with grey glabrous branches. *Stipular prickles* in pairs, stout, hooked, dark-brown, polished. *Leaf-rachises* very slender, finely downy, with a small gland at the base and one between the uppermost pinnæ; *stipules* minute, deciduous; *pinnæ* 2-3 pairs. *Leaflets* 3-5 pairs, ¼-½ in. long, shortly stalked, obliquely obovate, obtuse or minutely cuspidate, rigidly subcoriaceous, greyish-green, glabrous. *Spikes* 2-3 in. long, lax, cylindrical, drooping. *Flowers* white or pale-yellow, fragrant. *Corolla* twice the campanulate glabrous calyx. *Pod* 2-3 in. long, linear-oblong, straight, flat, gradually narrowed to a short stalk, glabrous, glossy, indehiscent, 3-5-seeded.

In the Saharanpur and Delhi districts. DISTRIB. Plentiful on the Suliman and Salt ranges, ascending to 4,500 ft.; also in the N. Punjab plain extending along the foot of the Himalaya as far as the Jumna, also in Afghanistan. Flowers March and April. A tasteless gum exudes from the bark. The heartwood is dark-brown streaked with black, and being extremely hard and durable it is prized for cart-wheels, sugarcane crushers, etc. The leaves and fallen blossoms are collected for cattle fodder.

10. A. concinna, *DC. Prod. ii, 464; W. & A. Prod. 277; D. & G. Bomb. Fl. 87; Brand. For. Fl. 188; F. B. I. ii, 296; Watt E. D.* Mimosa concinna, *Willd.; Roxb.; Fl. Ind. ii. 565.*—Vern. *Ailah, rassaul* (Oudh).

A large prickly climbing shrub. *Branchlets*, petioles and peduncles finely grey-tomentose, and armed with numerous scattered recurved prickles. *Leaf-rachis* 4-8 in. long, with a large gland near the base, and one between the uppermost pinnæ; *stipules* cordate-ovate; *pinnæ* 3-6 pairs, 2-3 in. long; *leaflets* 6-20 pairs, with usually a small odd one near the base of each pinna, about ¼ in. long, linear, obtuse, very unequal at the base, pale-green above, glaucous beneath, nearly glabrous, acid. *Heads* globose, about ½ in. broad, pinkish in bud, arranged in large panicles; *bracts* obliquely cordate-ovate. *Calyx* ⅓ in., tubular, crimson. *Corolla* little exserted, white veined with red. *Pod* 3-4 in., shortly stalked, straight, thick and succulent; sutures broad, slightly constricted between the 6-10 seeds.

Dehra Dun (rare), abundant in the Kheri and Bahraich forests in N. Oudh. DISTRIB. W. Himalaya in Jaunsar, Bengal, S. India, Burma; also in the Malay Islands and China. Flowers during April and May, and the fruit ripens in the cold season. The pods are used as a substitute for soap as well as for dyeing and tanning, and the pods and leaves are medicinal. The acid leaves are made into chutney.

11. A. Intsia, *Willd. Sp. Pl. iv, 1091*; *W. & A. Prod. 278*; *D. & G. Bomb. Pl. 83*; *F. B. I. ii, 297 in part*; *Watt E. D.*; *Prain in Journ. As. Soc. Beng. LXVI, part ii, 510.* Mimosa Intsia, *Linn.*; *Roxb.*; *Fl. Ind. ii, 565.*

A large prickly climber. *Branches* downy and armed with numerous recurved prickles usually in vertical lines, afterwards fluted. *Leaf-rachis* with one gland at the base and smaller ones between the uppermost pinnæ; *pinnæ* 6-8 pairs, 2-3 in. long; *leaflets* not crowded, 8-12 pairs, up to ½ in. long and ⅛-¼ in. broad, ligulate-oblong, minutely cuspidate, dark green above, pale beneath, glabrous or nearly so on both surfaces. *Peduncles* 1-1½-nate, finely downy. *Heads* yellow, under ½ in. broad; *bracts* minute, lanceolate. *Pod* 4-6 in. long, thin, straight, ligulate, glabrescent, dehiscent, 8-12-seeded.

Dehra Dun and Siwalik range. DISTRIB. Outer Himalaya and throughout the greater part of India, also in Burma. Flowers April-August. The bark is said to be used as a substitute for soap for washing the hair.

12. A. cæsia, *W. & A. Prod. 278*; *Brand. For. Fl. 189 (in part)*; *Prain in Journ. As. Soc. Beng. LXVI, part ii, 510.* A. Intsia, *Willd. var. cæsia, F. B. I. ii, 297 (in part)*; *Watt E. D.* A. alliacea, *Ham.*; *Royle Ill. 182.*

A more extensive climber than *A. Intsia*. It may also be distinguished by the greater number of pinnæ, and the crowded much more numerous and narrower leaflets are always hairy beneath.

Dehra Dun and Siwalik range, Merwára. DISTRIB. Sub-Himalayan tracts of the Punjab, and on the W. Himalaya up to 3,000 ft., and in Sikkim up to 5,000 ft., extending to Bengal, C. and S. India and to Burma. Flowers during the rainy season.

13. A. pennata, *Willd. Sp. Pl. iv. 1090*; *W. & A. Prod. 227*; *Brand. For. Fl. 189*; *F. B. I. ii, 297 (in part)*; *Watt E. D.*; *Prain in Journ. As. Soc. Beng. LXVI, part ii, 510.* A pinnata, *D. & G. Bomb. Fl. 87.* Mimosa pennata, *Linn.*; *Roxb. Fl. Ind. ii, 565.* M. torta, *Roxb.*; *Fl. Ind. ii, 566.*

A large scandent bush or strong creeper, often enveloping the tallest trees. *Branches* and branchlets armed with many slightly recurved dark and shining prickles ; young twigs glabrous or slightly pubescent. *Leaf-rachis* 6 in. long, pubescent, not prickly beneath ; *petiole* ¾-1 in., with a projecting gland above the base ; *pinnæ* 8-15 pairs, 1¼-2 in. long, with glands between the upper ones ; *leaflets* 40-50 pairs, crowded and overlapping, sessile, narrowly linear, firm, glabrous. *Panicles* exceeding the leaves ; *bracts* small, linear ; *peduncles* ½ in. or more, 1-4-nate. *Heads* ½ in. in diam., white or pale-yellow. *Pod* 4-6 in. long, linear-oblong, acute or acuminate at both ends, shortly stalked, flat, thin, glabrous, sutures somewhat thickened. *Seeds* 6-10.

Forests of Dehra Dun, the Siwalik range, Northern Oudh and Bundelkhand. DISTRIB. C. and E. Himalaya, ascending to 5,000 ft., C. and S. India to Ceylon, Burma and Malay Islands ; also in Trop. Africa and Natal. Flowers June to August.

VAR. arrophula, *Bak. in F. B. I. ii, 298 ; Prain in Journ. As. Soc. Beng. l. c. 250, 510.—Leaf-rachis* glabrous and usually prickly beneath ; petiolar glands large, interpinnular glands 2-3 ; *leaflets* membranous. *Peduncles* 4-6-nate.—Merwára (Duthie). DISTRIB. E. Himalaya, Andaman Islands.

73. ALBIZZIA, Durazz. ; Fl. Brit. Ind. ii, 298.

Trees, rarely climbing shrubs. *Leaves* bipinnate. *Flowers* (in the Indian species) in globose heads, sessile or pedicelled, usually 5-merous, and all hermaphrodite. *Calyx* campanulate or funnel-shaped, distinctly toothed. *Corolla* funnel-shaped, *petals* firmly united below the middle. *Stamens* indefinite, 1-adelphous at the base ; *filaments* several times the length of corolla ; *anthers* minute, not gland-crested. *Ovary* sessile or shortly stalked ; *style* filiform ; *stigma* minute, capitate. *Pod* large, thin, flat, strap-shaped, straight, indehiscent or subindehiscent, continuous within, the sutures not thickened.—Species about 50, distributed throughout the tropics of the Old World.

Leaflets 20-45 pairs, narrowly falcate, main nerve very close to upper edge ; stipules large . . . . . 1. *A. stipulata.*

Leaflets 6-20 pairs, broadly oblong ; stipules small.

Flowers stalked, pod straw-coloured . 2. *A. Lebbek.*

Flowers sessile, pod brown or reddish-brown.

Midrib of leaflets nearer the upper edge . . . . . 3. *A. odoratissima.*

Midrib of leaflets nearer lower edge . 4. *A. procera.*

1. A. stipulata. *Boiv. Encycl., XIX, Siécle ii, 33; D. & G. Bomb. Fl. 88; Brand. For. Fl. 178; F. B. I. ii, 300; Watt E. D.; Prain in Journ. As. Soc. Beng. LXVI, part ii, 255, 515.* Acacia stipulata, *DC.; W. & A. Prod. 274; Royle Ill. 181.* Mimosa stipulacea, *Roxb. Fl. Ind. ii, 549.*—Vern. *Siran.*

A large flat-topped quick-growing tree with dark-grey rugose bark. *Stem* 3-4 ft. thick. Young shoots finely grey-downy. *Leaves* evenly pinnate; *rachis* 6-18 in. long, with a large sessile gland above the base and smaller ones between the pinnæ, pubescent; *stipules* 1-1½ in., obliquely cordate-acuminate, velvety beneath, pubescent above; *pinnæ* 6-20 pairs, 2½-4 in. long; *leaflets* 20-45 pairs, ¼-½ in. long, sessile, narrowly falcate, acute, membranous, glabrous and pale-green above, glaucous and downy beneath, the midrib very close to the upper margin. *Heads* in axillary panicled racemes. *Bracts* ½ in. long, ovate-acuminate, pubescent, caducous. *Flowers* ½-1 in. long, shortly stalked, yellowish-white, the free portion of the filaments usually tinged with pink. *Calyx* densely hairy outside; teeth short, acute. *Corolla* ½ in. long, densely hairy outside, segments lanceolate, acute. *Pod* 5-6 in. long, ¾-1 in. wide, thin, rigid, pale-brown, indehiscent, 8-10-seeded.

Typical *A. stipulata* probably occurs here and there in the Sub-Himalayan forest tracts of Rohilkhand and Oudh. DISTRIB. Tropical W. Himalaya east to Sikkim, ascending to 4,000 ft., and south to Ceylon; also in the Andaman and Nicobar Islands, Burma, Malay Penins. and Islands. Flowers April to June. The tree yields a gum, which the Nepalese use for sizing the paper they make from *Daphne*. The foliage is lopped for fodder. The heartwood is brown, but not very durable.

Var. Smithiana. *Prain in Journ. As. Soc. Beng. l.c.* Mimosa Smithiana, *Roxb.; Fl. Ind. iii 550.*—Vern. *Bhandir.*—A tall tree with a longer trunk and narrower head than in the type. Bark greenish-grey, smooth and wrinkled. Stipules much smaller. Stamens greenish.—Dehra Dun in swampy places (Kanjilál), probably also in Rohilkhand and N. Oudh. DISTRIB. Sylhet (Roxburgh).

2. A. Lebbek, *Benth. in Hook. Journ. Bot. iii (1844), 87; D. & G. Bomb. Fl. 88; Brand. For. Fl. 176; F. B. I. ii, 298; Watt E. D.* Acacia speciosa, *Willd.; W. & A. Prod. 275; Royle Ill. 181.* Mimosa Serissa, *Roxb.; Fl. Ind. ii, 544.*—Vern. *Siris, sirsa.*

A large unarmed deciduous tree, with greyish bark. *Leaves* evenly 2-pinnate; *rachis* 3-9 in. long, with a large sessile gland near the base and 2-3 interpinnular ones; *pinnæ* 2-3 pairs, 4 in. long; *leaflets* 5-9 pairs, subsessile, 1-2 in. long, obliquely elliptic-oblong or obovate-oblong, obtuse or retuse, glabrous or slightly pubescent beneath, pale-green. *Flowers* 1½ in. across, white, fragrant; *peduncles* solitary or 2-4 together from the axils of the upper leaves, or corymbose at the ends of short leafless branches; *pedicels* slender, puberulous. *Calyx* about ⅛ in.; teeth short, deltoid. *Corolla* twice as long as the calyx, *tube* glabrous; *lobes* ovate-lanceolate, hairy outside; *filaments* rose-coloured, united within the calyx-tube. *Pod* 4-12 in. long by 1-2 in.

broad, linear-oblong, blunt at both ends, flat, compressed, smooth and glossy, straw-coloured with pale-brown patches over the seeds; sutures slightly thickened. *Seeds* 4-12, pale-brown.

Indigenous in Dehra Dun and in the Saharanpur forests, and along the base of the Himalaya in Rohilkhand and N. Oudh, planted extensively in other parts of the area. DISTRIB. W. Himalaya up to 5,000 ft. and eastward to the Khasia Hills, Bengal, C. and S. India to Ceylon; also in Burma, the Andamans, Malaya, China, N. Australia and Trop. Africa, but often cultivated in those and in other countries. Flowers in April and May. The pods ripen in October, and remain for a long time on the tree. The dark-brown heartwood is tough and durable, and is used for a variety of purposes. The bark, leaves, flowers and seeds are employed medicinally. The leaves afford excellent fodder, and the tree is in some places cultivated for this purpose. A pellucid gum exudes from cracks in the bark.

3. A. odoratissima, *Benth in Hook. Journ. Bot. iii (1844), 88; D. & G. Bomb. Fl. 83; Brand. For. Fl. 175; F. B. I. ii, 299; Watt E. D.* Acacia odoratissima, *Willd.; W. & A. Prod. 275.* Mimosa odoratissima, *Linn.; Roxb.; Fl. Ind. ii, 546.*—Vern. *Siris, kali siris.*

A tall erect unarmed tree, with dark-grey bark. *Leaves* evenly 2-pinnate. *rachis* 6-12 in. long, finely downy, with a large sessile gland near the base, and 1-2 smaller ones between the upper pairs of pinnæ; *stipules* small, deciduous; *pinnæ* 3-4 pairs, 5-8 in. long; *leaflets* 8-20 pairs, ¾-1 in. long, sessile, obliquely oblong, obtuse, rigidly subcoriaceous, dark-green and almost glabrous above, glaucous and appressed-pubescent beneath, midrib parallel to upper edge and not far removed from it. *Heads* small, few-flowered, arranged in a terminal panicle; *peduncles* ¾ in., slender, puberulous, usually in fascicles on the small corymbose branchlets. *Flowers* sessile, ½-1 in. across, yellowish-white with pale-yellow stamens, fragrant. *Calyx* hairy, teeth obscure. *Corolla* 3 times as long as the calyx, silky, segments ovate-lanceolate. *Pod* 6-9 in. and about 1 in. wide, thin, flexible, reddish-brown, indehiscent, 8-12-seeded.

Forests of Dehra and Siwalik range, Bundelkhand and Merwára. DISTRIB. Sub-Himalayan tract west to the Indus, Bengal, C. and S. India to Ceylon, and in Burma. Flowers April to June. The tree is never quite leafless. The dark-brown heartwood is very hard, and is largely used for cart-wheels, oil-mills, etc. The bark and leaves are medicinal. A dark-brown gum exudes from the bark. The foliage affords good fodder for cattle.

VAR. mollis, *Benth.*, is mentioned in the *Fl. Brit. Ind. l.c.* as having been collected by Thomson in Rohilkhand, and by Edgeworth on the Siwalik range. It differs by having densely greydowny leaflets and leaf-rachises the former being less rigid than in the type. I have seen no specimen.

4. A. procera, *Benth. in Hook. Journ. Bot. iii (1844) 89; Brand. For. Fl. 175, t. xxvi; F. B. I. ii, 299; Watt E. D.; Prain in Journ. As. Soc. Beng. LXVI, part ii, 513.* Mimosa procera, *Roxb. Fl. Ind. ii, 548.* M. elata, *Roxb. l. c., 546; Royle. Ill. 181.*—Vern. *Safed siris, karha, dun siris.*

A tall unarmed quick-growing tree with yellowish or greenish white bark. *Leaves* evenly 2-pinnate ; *rachis* 12-18 in., glabrous, with a large gland near the base, *pinnæ* 2-6 pairs, 5-6 in. long ; *leaflets* 6-12 pairs, with an ovate gland between the last pair, 1-2 in. long, obliquely ovate to ovate-oblong, blunt or subacute, obliquely cuneate on upper margin, rounded on the lower, dark-green and glabrous above, pale and appressed-pubescent beneath, midrib nearer the lower margin. *Heads* small, many-flowered, usually in fascicles of 3-5, arranged on the lax corymbose branches of terminal panicles. *Flowers* 3-4 in. across, sessile, yellowish-white with pale-yellow stamens. *Calyx* glabrous ; teeth triangular, distinct. *Corolla* ¼ in. long ; segments lanceolate, half as long as the tube, densely hairy outside. *Pod* 4-8 in. long, about ¾ in. wide, thin, flexible, bright reddish-brown, shining. *Seeds* 6-12, pale-brown.

Forests of Debra Dun and Saharanpur, and in the Sub-Himalayan districts of Rohilkhand, N. Oudh and Gorakhpur ; usually in moist localities. DISTRIB. Along the base of the Punjab Himalaya, Bengal, C. and S. India, Andamans, Burma ; also in the Malay Islands and the Philippines. A handsome tree, flowering from June to Aug. The reddish pods are conspicuous during the cold season. The brownish heartwood seasons well and is durable, and is in great request for cart-wheels, agricultural implements, etc. Excellent charcoal can be prepared from the wood. The bark is used for tanning, and in times of scarcity it is ground up with flour and eaten.

A lucida, *Benth. in Hook. Journ. Bot. iii (1844), 86 ; Brand. For. Fl. 174 ; F. B. I. ii. 299 ; Watt E.D.* Mimosa lucida, *Roxb. ; Fl. Ind. ii, 544.*—A handsome, almost evergreen, tree with large dark-green acuminate leaflets. It is cultivated in gardens within the area, and is indigenous in Nepal, E. Bengal and in Burma.

Pithecolobium dulce, *Benth. in Hook. Journ. Bot. iii (1844), 199 ; Brand. For. Fl. 173 ; F. B. I. ii, 302 ; Watt E.D.* Mimosa dulcis, *Roxb. Fl. Ind. ii, 556.*—Vern.—*Vilayati imli.*—A large thorny tree introduced from Mexico to the Philippines and thence to India. It is cultivated in gardens within the area and throughout the plains of India. It is largely grown in S. India, where it is used chiefly for fuel. It makes an excellent hedge-plant. The thick twisted pods contain a quantity of sweet whitish pulp, which is eaten ; and the seeds contain a large amount of oil.

XLIV.—ROSACEÆ.

HERBS, shrubs or trees. *Leaves* stipulate, alternate, rarely opposite, simple or compound. *Flowers* usually 2-sexual and regular. *Calyx-tube* free or adnate to the ovary ; limb usually 5-lobed, often bracteolate, imbricate or valvate. *Petals* 5, rarely 0, inserted under

the margin of the disk, deciduous, usually imbricate. *Disk* lining the calyx-tube, or forming a ring at the base. *Stamens* perigynous, usually indefinite, in one or many series, rarely connate and unilateral; *filaments* subulate or filiform, usually incurved in bud; *anthers* small, didymous. *Ovary* of 1 or more free or connate carpels, with free or connate basal lateral or terminal styles; *stigmas* simple, penicillate or capitate; *ovules* 1 or more in each carpel. *Fruit* variable, of achenes berries or drupes, rarely capsular. *Seeds* erect or pendulous, albumen 0.—Species about 1,200, chiefly in the temperate regions of the world.

Spiræa cantoniensis, Lour. (S. corymbosa, Roxb.) is a handsome evergreen shrub with pure white flowers. It was introduced from China, and is now much grown as an ornamental plant in gardens within the area. The flowers open towards the end of the cold season.

Ripe carpels not inclosed within the calyx-tube.

Carpel 1, fruit a drupe with a hard bony stone.
Shrubs or trees with simple leaves . . 1. PRUNUS.

Carpels many, leaves usually compound.

Calyx ebracteolate, fruit of many small drupes. Climbing shrubs . . . 2. RUBUS.

Calyx bracteolate.

Ripe carpels on a fleshy receptacle . . 3. FRAGARIA.

Ripe carpels on a dry receptacle . . 4. POTENTILLA.

Carples adnate to the tube of the calyx, or, if free, included wholly within it.

Calyx-tube urceolate, fruit of many free achenes inclosed in the fleshy calyx-tube. Erect or climbing shrubs . . . . 5. ROSA.

Calyx-tube (or apex of peduncle) becoming fleshy after flowering and inclosing the carpels. Trees or shrubs.

Fruit a pome, 2-5-celled . . . 6. PYRUS.

Fruit small, drupe-like, inclosing 5 bony-nutlets . . . . . 7. CRATÆGUS.

1. PRUNUS, Linn.; Fl. Brit. Ind. ii, 312.

Shrubs or trees. *Leaves* alternate, simple, quite entire or serrate or crenate or glandular-serrulate; *petiole* often 2-glandular. *Flowers* white or red, solitary fascicled corymbose or racemed. *Calyx*

deciduous in fruit; lobes 5, imbricate. *Petals* 5. *Stamens* 15-60, perigynous, inserted in the mouth of the calyx-tube; *filaments* free. *Carpel* 1; *style* terminal; *ovules* 2, collateral, pendulous. *Drupe* with an indehiscent or 2-valved, 1-seeded, smooth or rugged stone. *Seed* pendulous; albumen scanty or 0.—Species about 80, chiefly in N. Temperate regions.

Besides the cultivated kinds mentioned below, 12 indigenous species of *Prunus* are described in the Fl. Brit. India, none of which are met with in the plains of N. India. The following are cultivated in gardens within the area of the Upper Gangetic Plain:—

1. P. persica, *Stokes; Brand. For. Fl. 191; F. B. I. ii, 313; Watt E. D.* Amygdalus persica, *Linn.; Roxb. Fl. Ind ii, 500; DC. L'Orig. Pl. Cult. 176.*—Vern. *Aru* (The peach).—A native of China, where it has been cultivated for over 2,000 years. It is now extensively grown in the plains of Upper India, and on the Himalaya, up to 10,000 ft. It has become quite naturalized on the hills, and in Dehra-Dun it is often found in a semi-wild condition. A smooth-skinned variety is known as the nectarine; and another, bearing a curiously flattened fruit (P. platycarpa, *Duc.*), is also cultivated within the area.

2. **P. armeniaca,** *Linn.; Roxb. Fl. Ind. ii, 501; Brand. For. Fl. 191; F. B. I. ii., 313; DC. L'Orig. Pl. Cult. 171; Watt E. D.* —Vern. *Zardálu* (The Apricot).—Sparingly cultivated within the area, the climate being less suitable than that of the hills for the production of good fruit. On the Himalaya it is very extensively grown, and very often has the appearance of being indigenous. There is very little doubt, however, as to its having originally come from China.

3. Puddum, *Roxb.; Brand. For Fl. 194; F. B. I. ii, 314; Watt E. D.* P. sylvatica, *Roxb Fl. Ind. ii, 501.* Cerasus Puddum, *Royle Ill. 205.*—Occasionally cultivated within the northern portion of the area. It grows wild on the W. Himalaya up to 6,000 ft., and bears a small cherry-like fruit which is used for making cherry brandy.

4. P. communis, *Huds.*, var. institititia; *Brand. For. Fl. 192; F. B. I. ii, 315; Watt E. D.* P. institititia, *Linn.; DC. L'Orig. Pl. Cult. 170.* P. spinosa, *Linn.* var. institititia, *Ind. Kew.* P. bokhariensis and Aloocha, *Royle Ill. 205.*—Vern. *Alucha*—(The Bullace).—This variety of plum is grown to great perfection in the plains of Upper India. The fruit is yellow with often a reddish tinge, and is very sweet and juicy when quite ripe. It is found wild in S. Europe, Armenia and South of the Caucasus. The true plum (P. communis, var. domestica) is cultivated to a small extent in the plains of N. India, but the fruit is inferior to that which is produced on the hills.

2. RUBUS, Linn.; Fl. Brit. Ind. ii, 326.

Creeping herbs or erect or sarmentose shrubs, almost always prickly. *Leaves* alternate, simple or compound; *stipules* free or

adnate to the petiole. *Flowers* in terminal and axillary corymbose panicles, rarely solitary, white or red. *Calyx-tube* broad; lobes 5, persistent. *Petals* 5. *Stamens* many. *Disk* coating the calyx-tube. *Carpels* many, on a convex receptacle; *style* subterminal; *ovules* 2, collateral, pendulous. *Drupes* many, 1-seeded, crowded upon a dry or spongy conical or cylindric receptacle. *Seed* pendulous.—Species about 200, chiefly in the N. Hemisphere.

Leaves 3-foliolate, petals white, fruit yellow	1. *R. ellipticus.*
Leaves 5-9-foliolate, petals pink, fruit black	2. *R. lasiocarpus.*

1. R. ellipticus, *Smith; Brand. For. Fl. 197; F. B. I. ii, 336; Watt E. D.* R. rotundifolius, *Wall.; Royle Ill. 203.* R. Gowreephul, *Roxb. Fl. Ind. ii, 517; W. & A. Prod. 298.* R. flavus, *Buch.—Ham. in Don Prod. 234; Brand. For. Fl. 197.*—Vern. *Zard-anchu.*

A large shrub, with stout trailing branches armed with scattered hooked prickles and densely shaggy with long reddish bristles. *Leaves* 3-foliolate, those at the base of the branchlets sometimes 1-foliolate; *petioles* 1-3 in.; *stipules* subulate; *leaflets* 2-4 in. long, orbicular obovate or elliptic, obtuse or abruptly acute, toothed, dark-green above, pale and more or less tomentose beneath. *Panicles* axillary and terminal, dense-fid.; *pedicels* short, *bracts* setaceous. *Flowers* ½-¾ in. across. *Calyx* densely pubescent, sometimes bristly; lobes ovate, acute or mucronate, erect in fruit. *Petals* exceeding the calyx, obovate, white. *Stamens* 1-seriate. *Carpels* silky. *Fruit* globose, exposed; *drupes* many, on a cylindric hairy receptacle, golden-yellow, succulent; *stone* rugose.

Dehra Dun and on the Siwalik range. DISTRIB. Abundant on the W. Himalaya up to 7,000 ft., eastward to Sikkim, Bhutan, the Khasia Hills, Burma and Yunan, and on the W. Ghats from Kanara south to Ceylon. Flowers during February and March, and the fruit ripens in April and May. The fruit is much eaten, either raw or as a preserve.

2. R. lasiocarpus, *Smith in Rees Cycl. XXX. n.-6; W. & A. Prod. 299; Royle Ill. 203; D. & G. Bomb. Fl. 89; Brand. For. Fl. 198; F. B. I. ii, 339; Watt E. D.* R. albescens, *Roxb.; Fl. Ind. ii, 519.* R. rosæfolius, *Roxb. l.c.* R. rotundifolius, *Royle l.c.*—Vern. *Káli anchhi.*

A large shrub with long spreading stems often rooting at the ends, armed with straight or curved prickles. *Branches* pruinose, glabrous, purple under the bloom, rarely glandular. *Leaves* 5-9 foliolate, 3-10 in. long; *stipules* ¼ in., linear-subulate; *leaflets* 1-3 in., ovate-elliptic or ovate-lanceolate, acutely and often doubly toothed, glabrous or silky above, densely white-tomentose beneath, the terminal one often lobed; lateral nerves straight, very prominent beneath. *Flowers* ⅓-⅔ in. across, in small axillary and terminal simple or subpanicled tomentose corymbs. *Calyx* densely woolly, lobes ovate or ovate-acuminate. *Petals* orbicular

or broadly obovate, usually shorter than the calyx, pink. *Carpels* many, tomentose. *Fruit* globose; *drupes* many, hoary, red turning to black when ripe.

Dehra Dun. DISTRIB. W. Himalaya up to 8,000 ft. and eastward to Sikkim, W. and S. India to Ceylon; also in Burma and Java. Flowers in Dehra Dun during Feb. and March. The fruit of this species is popularly regarded as the *blackberry* of India. There are several varieties.

3. FRAGARIA, Linn.; Fl. Brit. Ind. ii, 343.

Perennial scapigerous herbs, with creeping stolons. *Leaves* digitately 3- rarely 5-foliolate, very rarely pinnate or simple; *stipules* adnate to the petiole. *Flowers* white or yellow, often polygamous. *Calyx* persistent, with 5 bracteoles at its base; lobes 5, valvate in bud. *Petals* 5. *Stamens* many, persistent. *Carpels* many, on a convex receptacle; *styles* ventral, persistent; *ovule* 1, ascending. *Achenes* many, minute, sunk in the surface of a large fleshy receptacle. Species about 8, inhabiting temp. and alpine regions of the N. Hemisphere; also in S. America and the Mascerene Islands.

F. indica. *Andr. Bot. Rep. t. 479; Roxb. Fl. Ind. ii, 520; W. & A. Prod. 300; F. B. I. ii, 343; Watt E.D.* F. malayana, *Roxb. l.c.*

A perennial herb with a stout rootstock and many long slender prostrate stems, more or less silky hairy. *Leaves* distant; *stipules* leafy, toothed; *petioles* 1-5. in., very slender; *leaflets* usually 3, stalked or sessile, 1-1½ in. long, obovate, serrate, crenate or toothed, membranous. *Peduncles* axillary, solitary, 1-flowered, equalling the petioles; *bracteoles* large, cuneate-obovate, 3-fid. *Flowers* ½-1 in. in diam. *Calyx-lobes* ovate or lanceolate. *Petals* obovate, emarginate, yellow. *Fruit* globose or oblong, bright-red, spongy, insipid.

Dehra Dun, N. Oudh and in the Gorakhpur District. DISTRIB. Temp. and sub-tropical Himalaya from the Indus to Assam, up to 8,000 ft., Khasia Hills, Nilgiris, Penang; also in Afghanistan, the Malay Islands, Japan, Corea, and Formosa. The fruit is quite tasteless and not worth eating.

The Strawberry (F. vesca, *Linn.*) is grown to a large extent within the area of this flora, but chiefly in the neighbourhood of large towns. Owing to the need of more frequent importations of suitable varieties from Europe the quality of the fruit is usually inferior. As a wild plant it is found abundantly on the Himalaya at various elevations between 5,000 and 13,000 ft.

4. POTENTILLA, Linn.; Fl. Brit. Ind. ii, 345.

Perennial herbs, rarely shrubs. *Leaves* compound; *stipules* adnate to the petiole. *Flowers* white or yellow, rarely red, solitary or in

corymbose cymes. *Calyx* persistent, 5- rarely 4-bracteolate; lobes as many, valvate in bud. *Petals* as many, sometimes narrow. *Stamens* many, rarely few. *Disk* annular or coating the calyx-tube. *Carpels* many, rarely 1 or few, on a small dry receptacle; *style* persistent or deciduous; ventral or terminal; *ovule* 1, pendulous *Achenes* many, on a dry receptacle.—Species about 130, chiefly confined to the N. temp., Arctic and Alpine regions. Of the 39 species described in the Fl. Brit. India, only one is found within the area of the Upper Gangetic Plain.

P. supina, *Linn., Sp. Pl. 497; W. & A. Prod. 300; F. B. I. ii, 359; Watt E. D.* P. denticulata, *Wall.; Royle Ill. 202.* Comarum flavum, *Roxb.; Fl. Ind. ii, 521.*

Annual. Stems many, leafy. *Leaves* pinnately 3-9-foliolate, ½-3 in. long; *petioles* ½-2 in.; *stipules* ovate, entire; *leaflets* opposite or alternate, obovate oblong or cuneate, obtuse, lobulate or serrate. *Flowers* ¼-½ in. across, on slender axillary pedicels. *Calyx-lobes* and bracteoles obtuse or acute. *Petals* oblong, smaller than the calyx, yellow. *Achenes* minute, smooth or ridged; *styles* subterminal; *receptacle* globose, villous.

Rohilkhand, N. Oudh, Gorakhpur and Bundelkhand, also on river-banks in the Doab. Distrib. Up to 8,500 ft. on the N.-W. Himalaya from Kashmir and Baltistan eastward, and south to the Nilgiris; also in Afghanistan and westward to the Atlantic. The plains form differs from that of the Himalaya by having more slender stems and smaller flowers, and the achenes are smooth instead of being ridged.

5. ROSA, Linn.; Fl. Brit. Ind. ii, 363.

Erect, sarmentose or climbing shrubs, usually prickly. *Leaves* pinnate; *leaflets* serrate; *stipules* adnate to the petiole. *Flowers* terminal, solitary or corymbose, white yellow or red, *bracts* rarely persistent. *Calyx-tube* persistent, globose ovoid or pitcher-shaped; mouth contracted; lobes leafy, imbricate in bud. *Petals* 5, large. *Stamens* many, inserted on the disk. *Disk* coating the calyx-tube, all but closing its mouth by its thickened margin, silky. *Carpels* many, rarely few, in the bottom of the calyx-tube; *styles* subterminal, free or connate above; *stigma* thickened; *ovule* 1, pendulous. *Achenes* coriaceous or bony, enclosed in the fleshy calyx-tube. —Species widely diffused over the temperate regions of the N. Hemisphere, rarely extending to the tropics, except in mountain districts.

R. involucrata, *Roxb. Hort. Beng. 33; Fl. Ind. ii, 513; Brand. For. Fl. 199; F. B. I. ii, 365; Watt E. D.*

A stout erect or subscandent bush. *Branchlets* and inflorescence densely tomentose; *prickles* straight, compressed, often in pairs below the stipules. *Leaves* 3-4 in.; *stipules* small, laciniate; *leaflets* 3-4 pairs, elliptic or oblong, acute or acuminate, finely serrate, shining above, glabrous on both surfaces or tomentose beneath. *Flowers* 2-3 in. across, on short pedicels, solitary or in short corymbs; *bracts* large, lanceolate, more or less gland-serrate below; *peduncles* and pedicels sometimes gland-hairy. *Calyx-tube* obovoid, unarmed; lobes caudate-acuminate, entire deciduous. *Petals* retuse. *Fruit* globose, densely tomentose, *styles* distinct. *Achenes* many, pale-coloured.

Gorakhpur (Duthie's collector), and probably in other localities within the Sub-Himalayan tract westward to Dehra Dun. DISTRIB. Along the base of the Himalaya eastward to Bengal and Burma; also on Mt. Abu and in Mysore. A very handsome plant when in flower during the end of the cold season. It is essentially a tropical species, and is usually found growing gregariously in swampy ground. In Bengal during the rainy season, the plants are almost completely submerged, the fruiting stems alone being visible above the surface of the water.

R. damascena, *Mill.; Brand. For. Fl, 200; F. B. I. ii, 364; Watt E. D.*—Vern. *gulâb* (Damask Rose). Largely grown in native gardens within the area. The flowers, which are very fragrant, are collected for the manufacture of rose-water and attar.

R. multiflora, a climbing rose, with clusters of small double pink flowers, forms a conspicuous feature in Dehra Dun when in full blossom during the month of April. It is very common in roadside hedges, and as a climber on trees, and it seems to be gradually spreading throughout the Dun as a naturalized plant.

The cultivated roses imported from Europe thrive remarkably well in the gardens of Upper India.

6. PYRUS, Linn.; Fl. Brit. Ind. ii, 373.

Trees or shrubs. *Leaves* deciduous, simple or pinnate; *stipules* deciduous. *Flowers* white red or pink, in terminal cymes or corymbs; *bracts* subulate or linear. *Calyx-tube* urceolate turbinate or obconic; lobes 5, erect or reflexed, persistent or deciduous. *Petals* 5, quincuncially imbricate in bud. *Stamens* 20 or more; *filaments* sometimes connate at the base. *Disk* annular or coating the calyx-tube. *Carpels* 2-5, connate and adnate to calyx-tube; *styles* 2-5, free or connate below, *stigmas* truncate; *ovules* 2 in each cell, basal, collateral, ascending. *Fruit* (a pome) fleshy, 2-5-celled; cells with a membranous or cartilaginous often 2-valved endocarp, 1-2-seeded.—Species 50-60, found chiefly in N. temp. and mountain regions.

P. Pashia, *Buch.-Ham. in Don Prod. 236; F. B. I. ii, 374; Royle Ill. 206; Brand. For. Fl. 204.*—Vern. *Mehal.*

A medium-sized deciduous tree, with the young parts woolly. *Branchlets* of young trees often spinescent. *Leaves* 2-4 in. long, ovate or ovate-lanceolate, acuminate, crenulate, or serrulate when young, turning black and glabrous when old. *Cymes* corymbose or subumbellate, woolly; *pedicels* ½-2 in. long, stout in fruit. *Flowers* 1 in. across. *Calyx-lobes* ovate, acute, usually woolly outside, deciduous. *Petals* white and pink. *Styles* 3-5, free, woolly towards the base. *Fruit* ½-1½ in. in diam., globose, yellowish-brown, scurfy and covered with raised white spots.

Abundant in Dehra Dun. DISTRIB. Temperate Himalaya, from Kashmir to Bhotan, up to 8,000 ft., Khasia Hills, Ava; also in Yunan. Flowers Feb.-March in Dehra Dun, and the fruit ripens from Sept. to Dec. The fruit is eaten by the natives, but not until it is over-ripe. The wood is used for making walking sticks, tobacco pipes and other articles; and the foliage is lopped for fodder.

P. sinensis, *Lindl.; DC. L'Orig. Pl. Cult. 186; P. sinica, Royle Ill. 206.* Vern. *Nāshpati* (China pear). This is the Pear-tree as cultivated in the plains of N. India. It bears an extremely hard fruit, which is fit to eat only when cooked. It forms, however, an excellent stock on which to graft good varieties of the European pear (P. communis, *Linn.*). Some experiments recently undertaken at the Saharanpur garden with two kinds introduced from Florida, have been successful so far as to show that fruit equal in quality to some of the best European kinds can be obtained by grafting. The fruit of these grafted trees, which ripens at Saharanpur in August, has to be very carefully protected from hornets, wasps and birds, and the shrivelling of the stalks during very hot weather often causes the fruit to fall before it is fit for picking. The stock used in Florida, and known under the name of 'Sand Pear,' is no doubt the same as our Indian plains pear. According to Decandolle it is quite distinct from the European species (P. communis), and is found wild in Mongolia and Manchuria. It is cultivated in China and Japan.

The Apple (Pyrus Malus, *Linn.*) is grown to a small extent in gardens within the area, but the fruit is very inferior; excellent kinds are, however, easily obtainable from the neighbouring hills.

Eryobotrya japonica, *Lindl.; W. & A. Prod. 302; D. & G. Bomb. Fl. Suppl. 32; F. B. I. ii, 372; Watt E. D.* Mespilus japonica, *Thunb.; Roxb. Fl. Ind. ii, 510.* Photinia japonica, *Brand. For. Fl. 575.* (The Loquat tree.) A native of China and Japan. Largely cultivated within the area, and usually propagated by layers. At Saharanpur, where the tree thrives to perfection, two distinct varieties are grown, one with a large pear-shaped golden-coloured very sweet fruit, often containing only a single stone, and ripening towards the end of March; the other with a smaller round pale-coloured many-stoned fruit, ripening a little later and rather acid.

7. CRATÆGUS, Linn.; Fl. Brit. Ind. ii, 383.

Shrubs or small trees, often spiny. *Leaves* simple, lobed or pinnatifid; *stipules* deciduous. *Flowers* in terminal corymbose cymes, white or red; *bracts* caducous. *Calyx-tube* urceolate or campanulate; mouth contracted; lobes 5, persistent or deciduous. *Petals* 5, inserted at the mouth of the calyx-tube, imbricate in bud. *Stamens* many. *Carpels* 1-5, adnate to calyx-tube; *styles* 1-5; *stigma* truncate; *ovules* 2 in each cell, ascending. *Fruit* ovoid or globose, with a bony 1-5-celled stone, or with 1-5 bony 1-rarely 2-seeded stones —Species about 50, inhabiting N. temp regions, chiefly in America, extending south to Mexico and the Andes of New Grenada. Closely allied to *Cotoneaster*, under which genus the species are sometimes placed.

C. crenulata, *Roxb. Hort. Beng. 39; Fl. Ind. ii, 509; F. B. I. ii, 384.* C. Pyracantha, *Brand. For. Fl. 209.*

A large evergreen rigid glabrous spinescent shrub or small tree. *Leaves* crowded on short lateral branchlets, 1-2 in. long, linear-oblong or obovate, obtuse, narrowed into the very short petiole, very coriaceous, shining, nerves indistinct. *Corymbs* short, many-flowered, glabrous or puberulous. *Flowers* ¼-⅓ in. across, on slender pedicels, white. *Calyx-tube* hemispheric, lobes obtuse. *Petals* orbicular, shortly clawed; *styles* 5, inserted ventrally. *Carpels* 5, connate below. *Fruit* globose, less than ¼ in. in diam., orange-red, crowned with the erect calyx-lobes.

Dehra Dun, on the banks of streams. DISTRIB. From the foot of the Himalaya up to 8,000 ft. Flowers during April and May. The hard wood is used for axe-handles, etc. The English *Hawthorn* (C. Oxyacantha) is found on the W. Himalaya.

XLV.—SAXIFRAGACEÆ.

TREES, shrubs or herbs. *Leaves* alternate or opposite, rarely stipulate. *Inflorescence* various. *Flowers* hermaphrodite or polygamo-dioecious, the sepals, petals and stamens symmetrically regular. *Calyx* more or less adnate to the ovary, sometimes nearly free or quite inferior; lobes imbricate or valvate. *Petals* 5 or 4, rarely 0, perigynous or epigynous, rarely subhypogynous, imbricate or valvate. *Stamens* inserted with the petals, equalling or double their number, rarely numerous; staminodes or glands sometimes present between the stamens and ovary. *Ovary* of 2 or 3-5 carpels, usually 2- or 3-5-celled with axile placentas, less commonly 1-celled with parietal placentas;

styles as many as the carpels, distinct or combined nearly to the summits; *stigmas* capitate or lateral and subcapitate, *ovules* numerous. *Fruit* capsular or a berry. *Seeds* usually numerous, albuminous.—Species about 580, in the cold or temperate regions of the whole world and on the mountains of the tropics, together with a few genera of tropical trees.

A herb with opposite leaves . . .	1. VAHLIA.
A shrub with alternate leaves . .	2. ITEA.

1. VAHLIA, Thumb.; Fl. Brit. Ind. ii, 399.

Annual or biennial herbs. *Leaves* opposite, entire; *stipules* 0. *Flowers* axillary, usually geminate, subsessile or pedicelled. *Calyx-tube* entirely adherent to the ovary; *lobes* 5, valvate, persistent in fruit. *Petals* 5, epigynous. *Stamens* 5, epigynous. *Ovary* inferior, 1-celled, with 2 pendulous many-ovuled placentas; *styles* 2, *stigma* capitellate. *Capsule* dehiscing at the apex between the styles. *Seeds* many, minute, ellipsoid, smooth. Species 4, in subtrop. and trop. Africa and Asia.

V. viscosa, *Roxb. Fl. Ind. ii, 89; W. & A. Prod. 364; Royle Ill. 226; D. & G. Bomb. Fl. 90; F. B. I. ii, 399.*

A glandular-pubescent herb. *Stems* 6-12 in., erect or spreading. *Leaves* ½-1 in. long, subsessile, ovate or lanceolate, acute. *Flowers* subsessile, solitary or in pairs. *Calyx-lobes* ovate, acute. *Petals* ¼ in., obovate, white. *Filaments* with a minute hairy scale at the base. *Capsule* about ⅛ in., subglobose.

Bundelkhand (Edgeworth). DISTRIB.: In dry places, from the Punjab to S. India. This plant may be easily mistaken at first sight for an *Oldenlandia*, but the capsule in the latter is completely 2-celled.

2. ITEA, Linn.; Fl. Brit. Ind. ii, 407.

Shrubs or trees. *Leaves* alternate, petioled, glabrous, glandular-dentate or crenate. *Racemes* axillary and terminal, long, many-flowered. *Calyx-tube* adnate to base of ovary, lobes 5. *Petals* 5, oblong, perigynous, white, valvate. *Stamens* 5, perigynous. *Ovary* ¾-superior, 2-celled; *style* short, simple; *ovules* many, axile. *Capsule* ¾-superior, conical or elongate, many-seeded, splitting through the dissepiments and the style. *Seeds* elongate, testa loose, more or less produced at each end.—Species 6, found on the Himalaya, in the Indian Archipel, China, Japan, and one in Virginia.

I. nutans, *Royle Ill. 226; Brand. For. Fl. 213; F. B. I. ii, 409; Watt E. D.*

A shrub or small tree. *Leaves* 4-6 in. long, elliptic-oblong, acute or acuminate, rounded or subacute at the base, denticulate above the base, glabrous, veins conspicuous on both sides; *petiole* 1-1½ in., stout. *Racemes* solitary, elongate, exceeding the leaves; *pedicels* twice as long as the calyx-tube, glandular-pubescent, reflexed; *bracts* small, subpersistent. *Calyx-tube* hemispherical; teeth erect, subulate, persistent. *Petals* twice the calyx-lobes, linear, white, subpersistent. *Capsule* ½ in.

Dehra Dun. DISTRIB.: W. Himalaya from Hazara to Kumaon, up to 6,000 ft. Flowers April-July.

XLVI.—CRASSULACEÆ.

HERBS, often with a woody perennial root-stock, or under-shrubs usually succulent. *Leaves* alternate or opposite, usually simple (divided in *Kalanchoe*); *stipules* 0. *Flowers* regular, hermaphrodite or 1-sexual. *Calyx* usually 4-5-fid. *Petals* as many as the sepals, free or connate. *Stamens* hypogynous or on the petals, as many or twice as many as the petals. *Carpels* usually as many as the petals, with a hypogynous gland or scale at the base of each, free or connate below, narrowed upwards with the styles. *Ovules* usually many, on the edges of the carpels. *Follicles* dehiscing down the inner faces, usually many-seeded. *Seeds* albuminous.—Species over 400, spread over nearly the whole Globe, except Polynesia; abundant in S. Africa, and general in the N. Hemisphere.

KALANCHOE, Adans.; Fl. Brit. Ind. ii, 414.

Erect stout perennial herbs. *Leaves* opposite or the upper alternate. *Flowers* large, erect, in many-flowered subpaniculate cymes. *Calyx* 4-partite or 4-fid half-way down. *Corolla* with a flask-shaped tube and spreading 4-fid limb, much exceeding the calyx (yellow in the Indian species), persistent. *Stamens* 8, in two series, adnate to the corolla-tube. *Hypogynous scales* 4, linear or oblong. *Carpels* 4, adnate to the base of the corolla-tube, attenuated into long styles; *ovules* very many. *Follicles* 4. *Seeds* very many, oblong, ellipsoid, with 8-15 longitudinal ribs.—Species 50-60, chiefly in trop. and subtrop. Africa.

K. spathulata, *DC. Pl. Grass. t. 65; F. B. I. ii, 414; Watt E. D.* **K. varians,** *Haw.; Royle Ill. 222.*

A glabrous succulent perennial herb, 1-4 ft. high. *Leaves* spathulate-oblong, crenate; lower ones up to 10 in. long; upper 3-4 in. long, distant, narrower, sometimes 3-foliolate, sessile. *Flowers* clear-yellow, in corymbs or elongated panicles; lower bracts like the upper leaves, becoming smaller upwards. *Calyx* divided nearly to the base, in fruit often $\frac{3}{8}$ in. wide; lobes elongate, triangular from a broad base.

Dehra Dun. DISTRIB. Trop. Himalaya from Kashmir to Bhutan, up to 3,000 ft.; also in Burma, the warmer parts of China and in Java. The plant is said to be poisonous to goats and not eaten by cattle. The leaves and the expressed juice of this plant are used medicinally.

XLVII.—RHIZOPHOREÆ.

TREES or shrubs. *Leaves* opposite, usually stipulate, and coriaceous, glabrous; *stipules* inter-petiolar, very caducous. *Flowers* axillary, usually 2-sexual. *Calyx* usually more or less adnate to the ovary; limb produced beyond the ovary, 4-14 lobed; lobes valvate, persistent. *Petals* equal in number to the sepals, entire emarginate 2-fid or lacerate. *Stamens* usually twice the number of petals, in pairs opposite to and embraced by them; *anthers* usually 2-celled. *Ovary* 5-1-celled by solution of septa; *styles* usually connate; *ovules* usually 2 in each cell, pendulous. *Fruit* coriaceous, mostly indehiscent, 1-celled, 1-seeded. *Seed* pendulous, arillate or not; *albumen* fleshy or 0, *embryo* often germinating while the fruit is still on the tree.—Species 70, usually on the muddy shores of the estuaries of rivers in the tropics.

KARALLIA, Roxb.; Fl. Brit. Ind. ii, 439.

Trees and shrubs. *Leaves* petiolate, ovate or elliptic. *Peduncles* short, rather thick. *Flowers* small, in short 3-chotomous axillary branching cymes, sessile and often crowded. *Calyx-tube* minutely bracteate at the base; limb 5-8-lobed, campanulate; lobes erect, short, valvate. *Petals* 5-8, inserted on the margin of a crenulated disk lining the calyx-tube, clawed, orbicular, 2-fid or entire, subserrate or lacerate at the apex. *Disk* epigynous, 10-16-lobed. *Stamens* inserted with the petals, *filaments* filiform; *anthers* small, oblong. *Style* subulate or filiform. *Fruit* small, globose, coriaceous, 1-celled, 1-seeded. *Seed* globose, reniform; testa fibrous.—Species about 12, inhabiting Trop. Asia, Madagascar and Australia.

C. lucida. *Roxb. Hort. Beng. 92; Cor. Pl. iii, t. 211; Fl. Ind. ii, 431; King in Journ. As. Soc. Beng. LXVI, part ii, 318.* C. integerrima, *DC.; D. & G. Bomb. Fl. 95; Brand. For. Fl. 219; F. B. I. ii, 439; Watt E. D.*

A large evergreen tree with dark-grey bark, often developing aerial roots on the trunk. *Leaves* 3-5 in. long, obovate or elliptic-oblong, shortly cuspidate at the apex, cuneate at the base, entire or rarely serrulate towards the apex, glabrous, coriaceous, shining, margins recurved; lateral nerves many, spreading and freely inarching; *petioles* stout. *Cymes* umbellate and usually 3-chotomous, axillary and from the axils of fallen leaves, on stout peduncles about as long as the petioles. *Flowers* about ¼ in. long, sessile. *Calyx-tube* cylindric; teeth 6-7, triangular, incurved. *Petals* equal in number to the calyx-teeth, not embracing the stamens, orbicular, crenate, clawed, white. *Stamens* twice as many as, and longer than, the petals. *Fruit* globose, 1-celled and usually 1-seeded, glabrous, fleshy.

Dehra Dun, in swamps (Gamble and Kanjilal), forests of N. Oudh in the Bahraich District (Duthie's collector). DISTRIB. Moist evergreen forests of W. and S. India to Ceylon, Sikkim, Himalaya, Assam, Sylhet, Burma, Malay Peninsula and Islands; also in China and Trop. Australia. Flowers Dec.-April. The reddish-brown heartwood is hard, durable and very ornamental. It polishes well and is much prized for making into furniture.

XLVIII.—COMBRETACEÆ.

TREES or shrubs often climbers. *Leaves* alternate subopposite or opposite, sometimes ternate, petioled entire and usually simple; *stipules* 0. *Flowers* bracteolate at the base, usually in spikes or racemes, the racemes often panicled, sometimes polygamo-monœcious. *Calyx-tube* adnate to the ovary and produced above it; lobes usually 4-5, valvate. *Petals* 4-5 or 0. *Stamens* 4-5 or 8-9, on the calyx. *Ovary* altogether inferior, 1-celled; *style* simple, *stigma* usually simple; *ovules* 1-7, pendulous from the apex of the cell. *Fruit* coriaceous or drupaceous, generally indehiscent, ovate angular or often winged. *Seed* 1, without albumen.—Species about 320, in the tropics of whole world.

Flowers in spikes or racemes.
- Trees with alternate or subopposite leaves, petals 0 . . . . . 1. TERMINALIA.
- Shrubs with opposite leaves, petals 4-5 . 2. COMBRETUM.

Flowers in globose heads, petals 0 . . . 3. ANOGEISSUS.

1. TERMINALIA, Linn ; Fl. Brit. Ind. ii, 443.

Large trees. *Leaves* alternate or subopposite, exstipulate, entire or slightly crenulate, often with glands on the petiole or near the base of the midrib beneath. *Flowers* small, spicate, hermaphrodite or the upper flowers of spikes male; a narrow bract at the base of each flower, soon deciduous. *Calyx-tube* produced above the ovary with a campanulate mouth, limb of 5 short valvate triangular lobes, deciduous. *Petals* 0. *Stamens* 10, inserted on the calyx-tube; epigynous disk within them densely hairy. *Ovary* 1-celled, inferior; *style* long, simple; *ovules* 2 or 3, pendulous from the summit of the cell. *Fruit* ovoid, very variable in size, smooth or angular or with 2-5 wings, indehiscent, coriaceous. *Seed* solitary, exalbuminous. —Species about 105, inhabiting the tropics of the whole world.

Fruit fleshy, ovoid, without wings.	
Leaves long-petioled, fruit tomentose, not ribbed	*1. T. belerica.*
Petioles less than 1 in., fruit glabrous, more or less ribbed	*2. T. Chebula.*
Fruit coriaceous, distinctly winged.	
Leaves all subopposite, wings of fruit narrow	*3. T. glabra.*
Leaves subopposite or the upper alternate, wings of fruit broad . . .	*4. T. tomentosa.*

1. T. belerica, *Roxb. Hort. Beng. 33; Cor. Pl. t. 198; Fl. Ind. ii, 431; W. & A. Prod. 313; Royle Ill. 210; D. & G. Bomb. Fl. 91; Brand. For. Fl. 222; F. B. I. ii, 445; Watt E. D.* T. eglandulosa, *Roxb. Herb.* T. moluccana, *Roxb.; Fl. Ind. ii, 432.*—Vern. *Behera.*

A large deciduous tree with thick dark-grey bark. *Leaves* 3-8 in. long, alternate, crowded towards the ends of the branchlets, broadly elliptic or obovate, subacute or acuminate, often unequal at the base, coriaceous, glabrous when mature, papillose on upper surface, pale beneath, *petioles* long, rarely glandular at the apex. *Spikes* 3-6 in. long, axillary or from the axils of fallen leaves, slender, interrupted; *bracts* linear, caducous. *Flowers* about ¼ in. across, the males usually on upper part of spike, sessile, greenish-yellow, fœtid. *Calyx-teeth* triangular, woolly inside. *Stamens* much exserted. *Drupe* globose or ovoid, grey-tomentose, obscurely angled when dry.

A common forest tree within the area, also much planted DISTRIB. Plains and lower hills throughout India, except in the western desert tracts, extending to Ceylon and the Malay Penins. Flowers April-June, and the fruit ripens during the cold-season. The fruit constitutes one of the *myrobalans* of commerce; it is used in dyeing and tanning, and is largely exported. Native ink is prepared from it, and it is also used

medicinally, as also the oil extracted from the kernels. It is eaten greedily by all kinds of animals, both wild and domesticated; and the kernels are largely eaten by natives. The wood is used for various purposes. In N India it is usually steeped for some time in water in order to make it more durable when used for house-building.

Roxburgh describes and figures his *T. belerica* as having 2 opposite glands on the upper side of the apex of the petiole; this form, however, must be very rare, as no one except Roxburgh appears to have collected it.

2. **T. Chebula**, *Retz. Obs. v, 31; Roxb.; Fl. Ind. ii, 433; W. & A. Prod. 313; Royle Ill. 210; D. & G. Bomb. Fl. 91; Brand. For. Fl. 223, t. xxix. F. B. I. ii, 446; Watt E. D.*—Vern. *Har, harark.*

A large deciduous tree with thick dark-brown bark. Young parts rusty-pubescent. *Leaves* 3-6 in. long, distant, mostly subopposite, ovate or elliptic, usually acute, rounded or subacute at the base, more or less hairy when young; lateral nerves arcuate, prominent; *petiole* not exceeding 1 in., with 2 or more glands at its apex on the upper side. *Spikes* terminal, often panicled; *bracts* conspicuous, exceeding the flower-buds, caducous. *Flowers* all 2-sexual, sessile, dull-white or yellow, strong-scented. *Calyx-lobes* triangular, clothed with brown woolly hairs inside. *Filaments* far exserted. *Drupe* 1-1½ in. long, ovoid, or obovoid from a cuneate base, glabrous, more or less 5-ribbed when dry.

Forests of Dehra Dun and Saharanpur, Rohilkhand, N. Oudh and Bundelkhand. DISTRIB. Outer Himalaya, ascending to 5,000 ft., plains of Punjab and Bengal, Burma, Siam, Malay Islands, and from C. India to Ceylon. Flowers April-June, and the fruit ripens during the cold season. In Northern India the tree does not attain to any great size, but large trees, up to 100 ft. in height, are often met with south of the Nerbudda. The most important product of this tree is the dried fruit, which constitutes the black *myrobalan* of commerce, one of the most valuable of Indian tanning materials. The fruit is also much valued for medicinal purposes. The kernel is eaten, and the leaves afford good fodder for cattle.

Of the 6 varieties described in the Fl. Brit. India, var. 2 (*T. citrina* of authors partly) differs from the type only in having the young ovary quite glabrous. It is common in N. India from Kumaon to Bengal, also in Chota Nagpur. Var. 5, gangetica, *Roxb.; Fl. Ind. ii, 437 (sp.); Royle Ill. 210*, differs by having the branchlets, both surfaces of the adult leaves, and the inflorescence covered with brown silky hair. Sir George King believes that specimens collected by him in Dehra Dun and on the Siwalik range may belong to this variety. According to Edgeworth it is cultivated in N. W. India, and Roxburgh (*Fl. Ind. l.c.*) says that it is a native of the banks of the Ganges, where it blossoms and ripens its fruit.

3. **T. glabra**, *W. & A. Prod. 314; D. & G. Bomb. Fl. 91.* T. Arjuna, *Bedd. Fl. Sylv. t. 28; Brand. For. Fl. 224; F. B. I. ii, 447; Watt E. D.* T. Urjan, *Royle Ill. 209.* Pentaptera Arjuna, *Roxb.; Fl. Ind. ii, 438.* P. glabra, *Roxb.; l.c. 440.* P. angustifolia, *Roxb. l. c. 437.*—Vern. *Arjan, arjun, kowa* (Bundelkhand).

A large tree with a buttressed trunk and smooth grey bark. Young parts clothed with rust-coloured pubescence. *Leaves* 5-8 in. long, subopposite, oblong or elliptic, obtuse or shortly acute at the apex, narrowed towards the base and often cordate, sometimes slightly crenulate, hard, coriaceous, glabrous on both surfaces when mature, pale-brown beneath; lateral nerves 10-15, arcuate; *petiole* short, with 2 glands near its apex. *Spikes* terminal and axillary, usually panicled; *bracts* very small. Young *ovary* pubescent. *Fruit* 1-2 in. long, ovoid or obovoid-oblong, with 5-7 hard coriaceous narrow wings marked with ascending striæ.

Forests of Rohilkhand and N. Oudh, Bundelkhand (Edgeworth), usually on the banks of streams, planted as an avenue-tree in Dehra Dun. DISTRIB. Bengal, C. and S. India to Ceylon, cultivated in the Punjab. Flowers April and May, and the fruit ripens in the cold season. The bark and ashes are used in dyeing and tanning; the gum, bark, leaves and fruits are medicinal; the heartwood is brown with darker coloured streaks and very hard, but not very durable.

4. **T. tomentosa**, *W. & A. Prod. 314; Brand. For. Fl. 225; F. B. I. ii, 447; Watt E. D.* T. glabra, *var.* tomentosa, *D. & G. Bomb. Fl. 91?* Pentaptera tomentosa, *Roxb.; Fl. Ind. ii, 440.* Vern. *Sáin, saj, asin* (Bijnor), *sadar* (Bundelkhand).

A tall deciduous tree with dark deeply cracked bark. Young parts rusty-pubescent. *Leaves* subopposite or the upper alternate, 5-9 in. long, oblong or ovate, obtuse, unequal and somewhat cordate at the base, entire or rarely crenulate, coriaceous, glabrescent above, tomentose beneath or sometimes glabrous on both surfaces when mature; *petiole* short, with 2 glands near the base of the leaf. *Flowers* sessile, in erect panicled spikes, 2-sexual, dull-yellow; *bracts* lanceolate, longer than the buds. *Calyx-lobes* ovate, acute, hairy inside. *Fruit* 1-2 in. long, with 5 wings ¾-1 in. wide and transversely striated and crenulate.

Common in all the forests within the area, often associated with sál. DISTRIB. Valleys of the outer Himalaya to Nepal and Sikkim, up to 4,000 ft., Punjab plain east of the Ravi, and through W., Cent. and S. India to Ceylon; also in Bengal and Burma. Flowers June-Aug., and the fruit ripens between Feb. and April. The new leaves do not come out till May or June. The bark and fruit are used in tanning. The latter is classed as a *myrobalan*, but is very inferior to that of *T. belerica* and *T. Chebula*. The bark is also used medicinally. The leaves afford good fodder for cattle, and in the Central Provinces they are much used for feeding the tassar silkworm. The dark-brown and streaked heartwood is largely used for building purposes, and it makes excellent fuel and charcoal. The flowers are often attacked by an insect which produces galls in the place of fruit.

T. Catappa, *Linn.* (Indian Almond) is cultivated in gardens in the eastern portion of the area. It is a large very handsome tree with buttressed trunk, and the large leaves turn crimson before falling. The kernel is eaten. The tree is wild in the Malay Peninsula.

2. COMBRETUM, Linn.; Fl. Brit. Ind. ii, 452.

Large shrubs (except *C. nanum*), with long pendent or scandent branches, rarely spinescent. *Leaves* entire, petioled, opposite or more seldom alternate or ternate. *Flowers* polygamo-dioecious, often in panicled spikes or racemes; *bracteoles* small. *Calyx-tube* constricted above the ovary, more or less produced, urceolate, funnel-shaped or tubular; limb 4-5 lobed, deciduous. *Petals* as many as the calyx-lobes (rarely 0), placed on the calyx-limb. *Stamens* twice as many as the petals, inserted in 2 series with them. *Ovary* inferior, 1-celled; *style* subulate, simple; *ovules* 2-5, pendent from the top of the cell. *Fruit* with 4-5 wings angles or ridges, dry, generally indehiscent. *Seed* 1.—Species 160, in all tropical regions, except of Australia and Polynesia.

A large climbing shrub with 5-merous flowers . *1. C. decandrum.*

A small decumbent undershrub with 4-merous flowers . . . . . *2. C. nanum.*

1. C. decandrum, *Roxb. Cor. Pl. i, 43, t. 59; Fl. Ind. ii, 232; Brand. For. Fl. 221; F. B. I. ii, 452; Watt E. D.* Poivrea Roxburghii, *DC.*; *W. & A. Prod. 317.*—Vern. *Ruel* (Dehra Dun), *punk* (N. Oudh).

A large shrub with many pendulous and subscandent branches, conspicuous when in flower by its bracts which become creamy white. Young parts silky-pubescent. *Leaves* opposite, 4-5 in. long, elliptic-oblong, abruptly acuminate, glabrous on both surfaces when mature, or with tufts of hairs in the axils of the nerves beneath, *petiole* ½ in. *Flowers* 5-merous, about ¼ in. long, greenish-white, in dense very villous racemes which form large terminal panicles; *bracts* 2-3 in. long, villous, becoming petaloid at the time of flowering; *bracteoles* ¼ in., linear, subpersistent. *Calyx* urceolate, hardly constricted above the ovary, hairy within and without; lobes suberect, lanceolate-subulate, deciduous. *Petals* 5, oblong, glabrous. *Ovary* sessile, villous. *Fruit* about 1 in. long, oblong or elliptic, with 5 broad smooth membranous wings.

Abundant within the area, especially in the Sub-Himalayan tracts. DISTRIB. Throughout N. and Cent. India; less plentiful in the Punjab and becoming scarce towards S. India; common in Burma. Flowers during Feb. and March.

2. C. nanum, *Buch.-Ham. in Don: Prod. 219; Brand. For. Fl. 221; F. B. I. ii, 457; Watt E. D.*

A small decumbent nearly glabrous undershrub; branches 6-18 in. *Leaves* 2-4 in. long, broadly obovate or ovate-lanceolate, coriaceous, glabrous and shining, sparsely punctulate on both surfaces; main lateral nerves 3-4 pairs, arcuate; petiole ½-¾ in. *Racemes* few, simple, subterminal, on peduncles 1-2 in. long; *bracteoles* small, linear-spathulate.

Flowers 4-merous. *Calyx-tube* hairy at the base within, constricted above the glabrous ovary and funnel-shaped; teeth triangular, erect. *Petals* narrowly obovate, far exceeding the calyx. *Fruit* 1½ in. long by 1 in. broad, with 4 papery coriaceous wings, puberulous or subglabrous.

Open grass-lands in Dehra Dun and on the Siwalik range; Sub Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur, and in Bundelkhand. DISTRIB. Outer Himalaya from Jaunsar (up to 5,000 ft.) to Sikkim; W. Bengal and in the Cent. Provinces. The rootstock produces annually stems bearing the leaves and flowers, which are burnt down by jungle fires.

3. ANOGEISSUS, Wall.; Fl. Brit. Ind. ii, 450.

Trees or shrubs. *Leaves* alternate or falsely opposite, petioled, entire. *Flowers* in dense globose heads, on axillary peduncles usually shorter than the leaves. *Calyx-tube* long, attenuated above the ovary, subpersistent; limb small, with 5 lobes, deciduous. *Petals* 0. *Stamens* 10, in two series. *Ovary* inferior, 1-celled; *style* filiform, simple; *ovules* 2, pendulous from the top of the cell. *Fruit* small, coriaceous, compressed, 2-winged, packed horizontally into dense heads. *Seed* 1.—Species about 7, one in Tropical Africa, and the rest Indian.

Calyx-tube shorter than the fruit. A small tree with pendulous branches	*1. A. pendula.*
Calyx-tube longer than the fruit. Branches not pendulous.	
Flower-heads in fascicles or short racemes .	*2. A. latifolia.*
Flower-heads on long peduncles, usually solitary	*3. A. sericea.*

1. A. pendula, *Edgew. in Journ. As. Soc. Beng. xxi (1853), 171; Brand. For. Fl. 229; Ind. For. xxv. (1899), 236; F. B. I. ii, 451; Watt E. D.* Conocarpus myrtifolius, *Buch.-Ham.; Royle Ill. 209.*—Vern. *Dhao* (Merwára), *dhaukra* and *kadai* (Bundelkhand).

A small gregarious tree with pendulous branches, and appressed-pubescent branchlets. *Leaves* ¾-2 in. long, broadly lanceolate or oblanceolate, acute or obtuse, glabrous above and often silky beneath; secondary nerves 5-7 pairs. *Flower-heads* under ¼ in. in diam., on long slender axillary peduncles. Ripe *fruit* nearly orbicular, upper portion and short beak hairy.

Forests of Bundelkhand and Merwara. DISTRIB. South to the Panch Mahals and the Nerbudda river in Nimar. Flowers in Aug. The leaves turn to a dull purple-red before falling.

2. A. latifolia, *Wall.; Brand. For. Fl. 227; F. B. I. ii, 450; Watt E. D.* Conocarpus latifolia, *DC.; Roxb. Fl. Ind. ii. 442; Royle Ill. 210, t. 45;*

W. & A. Prod. 316; D. & G. Bomb. Fl. 91.—Vern. *Bákli, dhauri, dhao* (Bundelkhand).

A tree with smooth greyish-green bark. Young parts rusty-pubescent. *Leaves* 2-4 in. long, broadly elliptic, obtuse at both ends, usually glabrous when old; lateral nerves 8-14 pairs, prominent beneath and with many anastomosing branchlets. *Flower-heads* ½-⅓ in. in diam., fascicled or in short axillary racemes. Ripe *fruit* nearly orbicular, glabrous, shining.

Abundant in all the forest tracts within the area. DISTRIB. Punjab as far west as the Ravi, ascending to 3,000 ft. on the Himalaya, and through C. and S. India to Ceylon. Flowers May and June. The tree is leafless during the greater part of the dry season. The gum is employed by calico-printers as well as for tanning, and the leaves which yield a black dye are also used in tanning. The strong tough elastic wood is much used for axe-handles and for the axles of native carts.

3. **A. sericea,** *Brand. in Ind. For. xxv (1899), 287.* A. acuminata, *Wall. (in part); Brand. For. Fl. 228; F. B. I. ii, 450; Watt E. D.*—Vern. *Dhaukra* (Merwára).

A moderate-sized tree. *Branches* stiff, not pendulous, silky. *Leaves* 1-3 in. long, elliptic, shortly acuminate or acute, or sometimes obtuse, clothed with long silky hairs beneath; lateral nerves 4-6 pairs; *petioles* about ¼ in. *Flower-heads* ⅛ in. in diam.; *peduncles* long, often branched, frequently bearing numerous leafy bracts. *Fruit* tomentose; wings broader than long, jagged.

Kheri Dist. in Oudh (Duthie's collector), Bundelkhand (Edgeworth and Vicary), Saugor Dist. in C. Prov. (Jerdon), Merwára (Lowrie and Duthie). DISTRIB. Pachmarhi Hills (Brandis and Duthie), Gujarat (Dalzell).

VAR. nummularia.—A. nummularia, *King Mss. in Herb. Calc.*—*Leaves* much smaller, shortly stalked, reniform, retuse or emarginate; mucronate, grey-tomentose beneath; veins inconspicuous above, prominent beneath. *Peduncles* exceeding the leaves, often branched. *Flower-heads* rather smaller.—Merwára (Lowrie and Duthie), Rájputána (King). Flowers Nov.-Feb. This may prove to be a distinct species.

Quisqualis indica, L. (Rangoon-creeper) is found in many gardens of Upper India. It is a handsome scandent shrub with flowers white turning to bright-red. It is a native of Burma and the Malay Peninsula.

XLIX.—MYRTACEÆ.

TREES or shrubs, rarely herbs. *Leaves* opposite, seldom alternate or whorled, petioled, simple, usually entire, 3-nerved or pinnate-veined and usually with an intramarginal nerve, generally coriaceous and dotted with pellucid glands. *Stipules* if present small and deciduous.

Flowers usually regular and hermaphrodite, axillary, solitary or in spikes, cymes, corymbs or heads, often with 2 bracts at the base. *Calyx* superior or ½-superior, limb 4-5-many-fid or -partite, persistent or deciduous, valvate or imbricate, sometimes entire or closed in bud. *Petals* inserted on a disk surrounding the cavity of the calyx, equal in number to the calyx-lobes and alternate with them, rarely 0. *Stamens* usually many, inserted with the petals in several rows; *filaments* free or connate at the base or in bundles opposite the petals. *Ovary* inferior or ½-inferior, crowned by a fleshy disk, usually 2-many-celled and many-ovuled. *Fruit* usually crowned with the calyx-limb, either 1-celled and 1-seeded by arrest, or 2-many-celled with loculicidal or septicidal dehiscence; or baccate and indehiscent with the cells many-seeded or 1-seeded by arrest. *Seeds* angular cylindric or compressed, albumen 0.—Species about 2,800, in the tropical and subtropical regions of both hemispheres.

Leaves opposite, gland-dotted . . . 1. EUGENIA.
Leaves alternate, not gland-dotted.
Stamens all perfect, fruit angular, 1-seeded . . . . . 2. BARRINGTONIA.
Inner and outer stamens without anthers; fruit globose, many-seeded . . . 3. CAREYA.

1. EUGENIA, Linn.; Fl. Brit. Ind., ii, 472.

Trees or shrubs, smooth or rarely tomentose or villous. *Leaves* opposite, rarely alternate, coriaceous or membranous, pinnate-nerved. *Flowers* solitary and axillary or in short racemes (leafless branches), or in dense terminal cymes, or in terminal or lateral 3-chotomous panicles. *Bracts* usually small and deciduous. *Calyx-tube* globose or more or less elongate; lobes 4 rarely 5. *Petals* 4 rarely 5 or more or 0, free and spreading or united in a calyptra. *Stamens* many, in many rows, free or slightly combined into 4 bundles, *filaments* filiform; *anthers* small, versatile, bursting longitudinally. *Ovary* 2- rarely 3-celled; *stigma* small; *ovules* many in each cell. *Berry* drupe-like, rarely dry and fibrous, crowned with the persistent calyx-limb. *Seeds* few, globose, compressed.—Species about 650, chiefly in Trop. America and Asia, a few in Trop. Africa and Australia.

Leaves broadly ovate or oblong.
Leaves subcoriaceous, lateral nerves distant . . . . . 1. *E. operculata.*

Leaves coriaceous, tough; lateral nerves very close . . . . . *2. E. Jambolana.*

Leaves narrowly lanceolate, closely nerved . *3. E. Heyneana.*

1. E. operculata, *Roxb. Hort. Beng. 37; Fl. Ind. ii, 486; Brandis. For. Fl. 234; F. B. I. ii, 498; Watt E. D.* E. cerasoides, *Roxb.; Fl. Ind. ii, 488.*—Vern. *Piáman, rai-jáman, thuti* (Dehra Dun).

A moderate-sized tree with rough pale-brown or greyish bark. *Leaves* 4-6 in. long, ovate-oblong to elliptic, bluntly acuminate, cuneate towards the base, thinly coriaceous, glabrous, pale below and minutely dotted, turning red before falling; lateral nerves 8-12 pairs, prominent beneath, becoming indistinct towards the intramarginal nerve. *Flowers* 4-merous, small, greenish, subsessile, in 3-flowered cymes arranged in spreading lax 3-chotomous lateral panicles below the current year's leaves, branches 4-angular. *Calyx* campanulate; limb truncate or with very short obtuse lobes. *Petals* calyptrate, orbicular, concave. *Fruit* a globose or ovoid dark-purple 1-seeded berry.

Forests of Dehra Dun and the Siwalik range, Rohilkhand, N. Oudh and Gorakhpur. DISTRIB. Along the base of the Himalaya to Assam, Bengal, Burma and W. India to Ceylon; also in the Malay Peninsula and Islands, S. China and Yunan. Flowers April and May, and the fruit ripens in June and July. The fruit and leaves are used medicinally and the fruit is eaten as food. The wood is used in building and for agricultural implements.

2. E. Jambolana, *Lamk. Encycl. iii, 198; Roxb. Fl. Ind. ii, 494; Brand. For. Fl. 233, t. XXX; F. B. I. ii, 499; Watt E. D.* Syzygium Jambolanum, *DC.; W. & A. Prod. 329; D. & G. Bomb. Fl. 93.*—Vern. *Jáman* (Black Plum).

A medium-sized tree with smooth grey bark. *Branches* terete, pale when dry. *Leaves* 2½-4 in. long, rotund-ovate to oblong-ovate, bluntly acuminate subacute or obtuse, slightly narrowed at the base, firmly coriaceous, paler beneath, both surfaces turning brown when dry; lateral nerves many, close; midrib and intramarginal nerve prominent beneath; *petiole* ½-1 in. long. *Panicles* lateral, on the previous year's wood, rarely terminal, much divaricately branched, longer than the leaves. *Flowers* many, sessile, ⅛ in. across, white. *Calyx* campanulate, suddenly contracted into a stout pseudo-stalk; limb at first 4-lobed, afterwards truncate. *Petals* 4, orbicular, calyptrate. *Fruit* oblong or ovoid-oblong, sometimes as large as an olive, dark-purple, juicy, 1-seeded.

Common throughout the area, especially in moist localities, but often associated with sál (Shorea robusta). DISTRIB. Throughout India, except in the desert tracts. It flowers in March and April and the fruit ripens in June and July. The new leaves, which appear in March, are of a bright copper colour. The tree is extensively cultivated for its fruit, which is largely eaten by natives either raw or pickled. It is astringent and rather acid. Various parts of the tree are medicinal, and the bark is used in dyeing and tanning, the wood is durable, and as it resists the action of water it is used very often in the construction of wells. The tree is considered sacred by Hindus.

VAR. microcarpa, *Thwaites.* E. Jambolana var. caryophyllifolia, *F. B. I. l.c.; Watt E. D.* E. caryophyllifolia, *Lamk.; Roxb. Fl. Ind. ii, 486.* Syzygium lateriflorum, *Royle Mss.*—Vern. *Jamoa.*—*Leaves* oblong-lanceolate, falcately acuminate. *Panicles* shorter and with stouter branches. *Berry* globose, about the size of a large pea.—A smaller tree with pendulous branchlets. It is largely used as a boundary fence for fruit gardens. Flowers in June. The fruit is sometimes eaten.

3. E. Heyneana, *Duthie in F. B. I. ii, 500.* Syzygium Heyneanum, *Wall.* S. salicifolium, *Grah.; D. & G. Bomb. Fl. 94 (not of Wall.).*

A small tree or shrub. *Leaves* 3-5 in. long, shortly petioled, narrowly lanceolate or elliptic, obtusely acuminate, finely and closely nerved. *Panicles* laxly branched, usually lateral from the axils of fallen leaves. *Calyx-lobes* unequal. *Petals* united, concave, white. *Fruit* ½ in. long, oblong, crowned by the cup-like calyx-limb.

Bundelkhand (Edgeworth, Duthie), Saugor (Vicary), usually found on river-banks. DISTRIB. Chota Nagpur, Central and W. India. The fruit is eaten.

2. BARRINGTONIA, Forst.; Fl. Brit. Ind. ii, 506.

Trees. *Leaves* alternate, crowded towards the ends of the branches, entire or slightly crenate-serrate, pinnate-nerved, not dotted. *Flowers* in elongated terminal and lateral racemes, less often in interrupted spikes; *bracts* small, deciduous. *Calyx-tube* scarcely produced, above the ovary; lobes 2-4, valvate, or 3-5, imbricate. *Petals* 4, rarely 5, much imbricate, somewhat adnate to the base of staminal tube. *Stamens* many, in several series, connate shortly into a tube at the base; *filaments* filiform, long, all bearing anthers. *Ovary* inferior, 2-4-celled, crowned with an annular disk; *style* long, simple; *stigma* small. *Ovules* 2-8 in each cell, pendulous. *Fruit* fibrous or somewhat berried, globose ellipsoid or 4-angular, crowned by the calyx, 1-seeded by abortion. *Seed* ovoid or ellipsoid, without albumen. —Species about 25, in Trop. Asia, Africa, Australia and Polynesia, often near the sea.

B. acutangula, *Gærtn. Fruct. ii, 97, t. 101; Roxb. Fl. Ind. ii, 635; W. & A. Prod. 333; D. & G. Bomb. Fl. 95; Brand. For. Fl. 235; F. B. I. ii, 503; Watt E. D.*—Vern. *Samundar-phal, injar.*

A small or moderate-sized glabrous tree. *Leaves* shortly stalked, 2-5 in. long, obovate-oblong or cuneate-elliptic, rounded or subacute at the broad apex, minutely denticulate or crenate, glabrous, pale beneath, main lateral nerves 10-13 pairs. *Flowers* deep pink, in long slender pendulous racemes; *bracts* oblong, caducous. *Calyx* with a short tube and 4 rounded imbricate ciliate lobes. *Petals* small. *Filaments* about 3 times as long as the petals, red. *Ovary* 2-celled. *Fruit* 1½-1¾ in. long, quadrangular-oblong, crowned by the persistent calyx-lobes.

Forests of Rohilkhand and N. Oudh, usually on the banks of streams or in moist ground. DISTRIB. Common in Bengal, and south to Ceylon; extending to Burma, the Malay Islands and N. Australia. Much cultivated in gardens. Flowers in May, and the fruit ripens in Sept. and Oct. Various parts of the plant are used medicinally. The wood is employed chiefly for boat-building and well-work. The pounded bark is often used for stupefying fish.

3. CAREYA, Roxb; Fl. Brit. Ind. ii, 510.

Trees or very small shrubs. *Leaves* alternate, crowded towards the ends of the branches, membranous, slightly crenate-serrate, pinnate-nerved, not dotted, narrowed at the base, sessile or petioled. *Flowers* large, in racemes or interrupted spikes. *Calyx-tube* campanulate or funnel-shaped, hardly produced above the ovary; lobes 4 ovate, imbricate. *Petals* 4, imbricate. *Stamens* many, in several series, slightly connate at the base; *filaments* filiform, innermost and outermost without anthers. *Ovary* inferior, 4-5-celled, crowned by an annular disk; *style* long, simple; *stigma* small; *ovules* many, on axile vertical placentas, in 2 rows in each cell. *Fruit* large, globose, fibrous, crowned with the calyx; dissepiment absorbed or obscure. *Seeds* many, lying in pulp, ellipsoid, albumen 0.—Species 4, three Indian, and one in N. Australia.

A small undershrub with stalked flowers . . . . 1. *C. herbacea.*
A tree with sessile flowers . . . . 2. *C. arborea.*

1. C. herbacea. *Roxb. Hort. Beng. 52; Fl. Ind. ii, 638; Brand. For. Fl. 237; F. B. I. ii, 510; Watt E. D.*

A small undershrub with a woody rootstock, throwing up annually herbaceous leafy flowering shoots about 1 ft. high. *Leaves* about 7 in. long, cuneate-oblong or obovate, obtuse or emarginate, serrulate, glabrous or obscurely puberulous; *petioles* up to ½ in. long. *Flowers* stalked, 1-2 on each shoot, terminal, jointed within the bracts; *bracts* 2, linear, at the base of the calyx. *Calyx* ¾ in. long; tube campanulate, terete; lobes ovate, obtuse. *Petals* 1-1¼ in. long, elliptic, greenish-purple. *Fruit* 1-1½ in. in diam., globose, crowned by the persistent calyx and style.

Open grassy places on the Siwalik range and in Rohilkhand and N. Oudh. DISTRIB. Eastward to Chittagong and the Khasia Hills, throughout the drier parts of Bengal and in the Central Provinces. Reduced to a small undershrub by periodical jungle fires. Flowers in March and April.

2. C. arborea. *Roxb. Hort. Beng. 54: Fl. Ind. ii, 638; W. & A. Prod. 334; D. & G. Bomb. Fl. 95; Brand. For. Fl. 236; F. B. I. ii, 511; Watt E. D.*—Vern. *Kumbi.*

A large deciduous tree with dark-grey bark. *Leaves* 6-12 in. long, shortly stalked, oblong or orbicular, obtuse or shortly acuminate; narrowed at

the base, crenate-denticulate, membranous, glabrous. *Flowers* 3-4 in. across, few together in spikes at the ends of the branches; *bracts* 3, unequal. *Calyx* ¾-1 in.; tube campanulate, obscurely pubescent; lobes ovate, obtuse, imbricate. *Petals* 1¼ in. long, elliptic, obtuse, white, caducous. *Filaments* red. *Fruit* globose, 2-3 in. in diam. crowned by the persistent calyx-segments and the remains of the long slender style.

Forests of Dehra Dun and Saharanpur, and in the Sub-Himalayan tracts of Rohilkhand, N. Oudh and Gorakhpur, in shady places. DISTRIB. E. Punjab, Bengal, Burma, W. Cent. and S. India to Ceylon. Flowers during March and April, and the fruit ripens in July. The tree yields a brownish gum. The bark is used in tanning, and various parts of the tree are medicinal. Coarse cordage and sacks are made from the inner bark. The reddish heartwood seasons well, and is hard, durable and elastic; it is used chiefly for agricultural implements.

The *Guava* tree (Psidium Guyava, *L.*) was introduced into India by the Portuguese, and is now extensively grown all over the hotter parts of India, and in some localities has become naturalized. It is indigenous in tropical S. America.

Several species of *Eucalyptus* (Australian gum trees) have been introduced into India. The results of extensive trials made at Saharanpur and Lucknow have shown that the following kinds are to be recommended for planting in the Upper Gangetic Plain:—E. rostrata, E. tereticornis and E. citriodora.

Melaleuca Leucadendron, L., an evergreen tree inhabiting Burma, Malaya and Australia, is cultivated in gardens for the sake of its handsome flowers. The variety called *minor* yields the cajaput-oil of commerce.

Myrtus communis, L. (Common Myrtle) is grown in most Indian gardens as an ornamental shrub, and is also used medicinally. It is a native of the Mediterranean region and extends to Afghanistan and Baluchistan.

L.—MELASTOMACEÆ.

HERBS or shrubs, more rarely trees, sometimes climbers. *Leaves* opposite or rarely whorled, usually petioled, entire or nearly so, often palmately 3-5-7-nerved from near the base to the apex, *stipules* 0. *Flowers* in spikes, panicles or corymbs, rarely solitary or clustered, regular, hermaphrodite. *Calyx-tube* united by vertical walls; limb usually 4-5- (or sometimes 3- or- 6-) lobed, sometimes truncate, rarely falling off in a cap. *Petals* as many as the calyx-lobes, contorted in bud. *Stamens* as many or more than (frequently twice as many as) the petals, the alternate ones often shorter or sometimes rudimentary, *filaments* bent inwards in bud; *anthers* usually opening at the summit by one or two pores, connective often appendaged near

the base. *Ovary* usually 4-5-celled ; *style* simple, usually filiform ; *ovules* many. *Fruit* a capsule or berry, included in the calyx-tube. *Seeds* minute, usually many ; *albumen* 0.—Species about 2,700, mostly in tropical S. America and in S.E. Asia.

Ovary 4-5-celled, seeds curved . .	1. OSBECKIA.
Ovary 3-celled, seeds straight . .	2. SONERILLA.

1. OSBECKIA, Linn. ; Fl. Brit. Ind. ii, 513.

Herbs or shrubs, mostly erect and setose ; branches commonly 4-gonous. *Leaves* opposite or sometimes ternate, entire, subcoriaceous 3-7-nerved. *Flowers* terminal, solitary capitate or panicled, purple mauve or white, often bracteate. *Calyx-tube* ovoid, carrying stellate hairs or pectinate scales ; limb 5- or 4-fid, usually stellately hairy. *Petals* 5-4. *Stamens* 10 or 8, equal or subequal ; *anthers* oblong, truncate attenuate or beaked ; *connective* not produced at base, slightly swollen or with 2 tubercles. *Ovary* inferior, 4-5-celled, more or less adherent to calyx, setose at apex ; *style* long, simple ; *ovules* very numerous, on placentas radiating from the axis. *Capsule* opening at the apex by 4-5 pores. *Seeds* many, curved through half a circle, covered with minute elevated points.—Species about 50, mostly Indian, one of which extends to China and N. Australia.

O. chinensis, *Linn. Sp. Pl. 345 ; Roxb. Fl. Ind. ii, 224 ; F. B. I. ii, 515.* O. angustifolia, *Don ; Royle Ill. 215.*

An annual up to 2 ft. high. *Branches* 4-gonous, appressedly hairy. *Leaves* variable, 2-6 in. long, broadly oblong or linear, 3-5-nerved, hairy on both sides, shortly petioled. *Flowers* capitate, rather small ; *bracts* ovate, glabrous or with a few scattered hairs on the back. *Calyx* campanulate, usually produced into a short neck when in fruit, sometimes with appressed pectinate scales ; teeth lanceolate, glabrous, not keeled on the back, margins ciliate. *Petals* ¼ in., mauve. *Anthers* with a beak about half their length. *Fruit* ½ in. or more.

Dehra Dun (Gamble), in damp places. DISTRIB. Outer Himalaya from Garhwál to Bhutan, Bengal, Assam and Khasia Hills ; also in China, Japan and N. Australia. Flowers in Sept. and Oct.

2. SONERILLA, Roxb. ; Fl. Brit. Ind. ii, 529.

Herbs, sometimes woody at the base, nearly always small, and often stemless. *Leaves* opposite, equal or unequal, from round to linear, entire or serrulate, 3-5-nerved. *Flowers* in racemes or scorpioid spikes, mostly red. *Calyx-tube* campanulate or funnel-shaped ; teeth 3,

short. *Petals* 3, acute or obtuse. *Stamens* usually 3, equal; anther-cells shortly divaricate at the base; connective not appendaged; *ovary* inferior, 3-celled, glabrous at the apex; *style* simple, filiform; *ovules* many, placentas axile. *Capsule* obovoid, trigonous, elongate funnel-shaped, or campanulate, opening at the top by 3 valves. *Seeds* very many, smooth or covered by glandular points or small tubercles, ovoid or ellipsoid.—Species over 100, throughout Tropical Asia.

S. tenera, *Royle Ill. 215, t. 45. f. 2; F. B. I. ii, 530.*

Annual. *Stems* 2-4 in., erect, weak, sometimes winged, puberulous or minutely pubescent. *Leaves* ½-½ in. long, ovate, subentire, sparsely hairy; *petiole* less than ¼ in. *Calyx-tube* puberulous and with lax hairs; teeth ovate, acute, as long as broad. *Petals* ¼ in., ovate, acute, rose-purple. *Anthers* short, oblong, hardly narrowed at the apex. *Capsule* nearly ¼ in., 3-gonous, funnel-shaped, the ribs between the angles very obscure. *Seeds* ovoid, smooth, raphe not excurrent.

Dehra Dun. DISTRIB. Subtropical W. Himalaya, abundant also in Chota Nagpur.

LI.—LYTHRACEÆ.

TREES, shrubs or herbs; branches often 4-angular. *Leaves* entire, opposite, sometimes alternate or whorled; *stipules* 0. *Flowers* usually in cymes or panicles, generally hermaphrodite, regular or rarely oblique. *Calyx-tube* free, persistent; lobes 3-6, valvate, often with accessory teeth. *Petals* as many as the calyx-teeth, rarely 0, inserted near the top of the calyx-tube. *Stamens* definite or many, inserted on the calyx-tube. *Ovary* usually free, 2-6-celled; *style* long, *stigma* capitate; *ovules* many, usually on axile placentas. *Fruit* coriaceous or membranous, free or more or less adnate to the base of the calyx, 2-6-celled, or by imperfection of partitions 1-celled, dehiscent or not. *Seeds* many, albumen 0.—Species about 275, chiefly in Trop. America, a few in temperate zones.

Ovary superior.
- Herbs, usually aquatic, calyx membranous . 1. AMMANNIA.
- Shrubs or trees, calyx herbaceous.
  - Calyx-tube curved, stamens 12 . . . 2. WOODFORDIA.
  - Calyx-tube straight, stamens 8 . . . 3. LAWSONIA.
  - Calyx-tube straight, stamens many . . 4. LAGERSTRŒMIA.

Ovary inferior, stamens many . . . . 5. PUNICA.

1. AMMANNIA, Linn.; Fl. Brit. Ind. ii, 566.

Annual glabrous herbs growing in damp places; branches often 4-angular. *Leaves* opposite and alternate, sometimes whorled, entire; *stipules* 0. *Flowers* small, axillary, solitary and subsessile, or in small 3-chotomous cymes; *bracteoles* usually 2. *Calyx* campanulate or tubular-campanulate, 3-5-toothed, often with minute interposed teeth or folds. *Petals* 3-5 or 0, small, inserted between the calyx-teeth. *Stamens* 2-8, inserted on the calyx-tube. *Ovary* inclosed in the calyx-tube, 1-5-celled, the septa very thin and often absorbed; *style* filiform or short, *stigma* capitate; *ovules* very many. *Capsule* membranous, globose or long-ellipsoid, inclosed in the calyx, 2-3-valved, or irregularly breaking up or circumsciss. *Seeds* many, nearly covering the axile placentas which often become ultimately free central, small, smooth, round on the back.—Species 30, in trop. or warm temp. zones of the whole world.

Flowers axillary, sessile, solitary or in spikes, capsule 2-4-valved.

Calyx in fruit campanulate, longer than broad.

Flowers solitary in the axils of reduced floral leaves . . . . . *1. A. peploides.*

Flowers in closely packed terminal spikes.

Leaves orbicular, capsule 4-valved . *2. A. rotundifolia.*

Leaves ovate or elliptic, capsule 2-valved . . . . . *3. A. tenuis.*

Calyx in fruit hemispheric, as broad as or broader than long.

Cal.-teeth 4, capsule 2-valved . . . *4. A. pygmæa.*

Cal.-teeth 5, capsule 3-valved . . . *5. A. pentandra.*

Flowers in whorls cymes or clusters, capsule circumsciss or bursting irregularly.

Flowers clustered in the leaf-axils.

Leaves narrowed to the base . . . *6. A. baccifera.*

Leaves rounded or cordate at the base . *7. A. salicifolia.*

Flowers in compound pedunculed cymes, leaves subauriculate at base.

Flowers and capsules small . . . *8. A. senegalensis.*

Flowers and capsules smaller and more numerous . . . . . *9. A. multiflora.*

1. A. peploides, *Spreng.; F. B. I. ii, 566.* A nana, *Roxb. i, 427 (not of Wall.).* Ameletia indica, *D. C.; W. & A. Prod. 303; D. & G. Bomb. Fl. 96.*

Stems 3-12 in. high, erect, or decumbent and rooting. *Leaves* opposite, ¼-¾ in. long, elliptic or obovate, sometimes almost petioled; midrib and nerves prominent beneath. *Flowers* in short axillary branches, sessile, solitary in the axils of reduced leaves; *bracts* in pairs, minute, filiform. *Calyx-tube* elongate-campanulate, ridged, with 4 acute triangular teeth at its mouth. *Petals* 4, minute or 0. *Capsule* 2-valved, ellipsoid. *Seeds* narrowly oblong, subfalcate, angular; hilum obscure.

Common in rice-fields. DISTRIB. Throughout the warmer parts of India, Andaman Islands as a weed of cultivation; also in China, Afghanistan and Persia.

2. A. rotundifolia, *Buch.-Ham. in Don Prod. 220; Roxb. Fl. Ind. i, 425; W. & A. Prod. 306.* Ameletia rotundifolia, *D. & G. Bomb. Fl. 96.*

Stems 4-6 in., extensively creeping and rooting. *Leaves* orbicular, ½ in. in diam., sessile or shortly stalked, approximate below, distant towards the spikes. *Flowers* sessile, closely packed in terminal simple or panicled spikes, dimorphic as regards the relative length of stamens and style, solitary in the axils of bract-like leaves; *bracteoles* 0 or very minute. *Calyx-tube* campanulate, not elongate; teeth 4, triangular, acute, without interjected folds. *Petals* 4, obovate, twice as long as the cal.-teeth, rose-coloured. *Capsule* 4-valved, ellipsoid, a little longer than broad. *Seeds* brownish-yellow, ellipsoid, peltate.

Abundant in swampy ground and rice-fields. DISTRIB. Throughout the plains of India and up to 6,000 ft. on the Outer Himalaya; also in China and Formosa.

3. A. tenuis, *Clarke in F. B. I. ii, 567.* Ameletia tenuis, *Wight; D. & G. Bomb. Fl. 96.*

Stems erect or shortly creeping at the base, simple and 3-4 in. or much branched and up to 10 in. high. *Leaves* opposite, ¼-½ in. long, sessile or nearly so, ovate or elliptic, often acute. *Flowers* sessile, closely packed in terminal spikes, dimorphic; peduncles filiform; floral leaves one to each flower, oblong or lanceolate; *bracteoles* lanceolate, exceeding half the length of calyx. *Calyx-tube* campanulate, rather elongate; teeth 4, acute, without interjected folds. *Petals* 4, obovate, not much longer then the calyx teeth. *Capsule* 2-valved, ellipsoid, much longer than broad. *Seeds* as in *A. rotundifolia.*

Common in wet ground and in the shallow pools of rocky river-beds in Bundelkhand, also in the districts of Agra and Etáwah. DISTRIB. Bengal and Central India.

4. A. pygmæa, *Kurz in Seem. Journ. Bot. V, 376; F. B. I. ii, 568.*

A minute annual with tufted stems 1-3 in. long. *Leaves* ¼-⅓ in., opposite, linear or narrow-oblong, almost petioled, obtuse or often with 2 points. *Flowers* sessile, axillary, not in spikes, most minute. *Calyx-tube* short, teeth 4, triangular, accessory teeth 0, or if any extremely minute.

Stamens 2, or occasionally 3-4. *Capsule* globose, 2-valved, slightly acute. *Seeds* black, ½-ellipsoid or nearly spherical, excavated on the plane face.

Dehra Dun (King). DISTRIB. N. Kanara, Rájmahal Hills, Chota Nagpur, Khasia, Burma ; also a weed in the Calcutta Botanic Garden.

5. A. pentandra, *Roxb. Fl. Ind. i, 427 ; W. & A. Prod. 305 ; F. B. I. ii, 568.* A. densiflora, *Roth ; W. & A. Prod. l.c.*

Stems 6-12 in., often with many opposite branches divergent at right angles and covered with flowers. Cauline *leaves* about 1 in. long, opposite, elliptic-oblong, sessile, faintly nerved ; upper floral leaves bract-like, oblong, broad-based. *Flowers* solitary, axillary, sessile, not in distinct spikes ; bracteoles subulate, as long as the calyx. *Calyx-teeth* 5, lanceolate, very acuminate ; accessory teeth 5, subulate, often as long as the primary. *Petals* 5, narrow-obovate, small or 0. *Capsule* spherical or globose, depressed. *Seeds* black, hemispheric, excavated on the plane face.

Common in moist ground. DISTRIB. Throughout India ; also in China, Australia and Trop. Africa.

6. A. baccifera, *Linn. ; D. & G. Bomb. Fl. 97 ; F. B. I. ii, 569 ; Watt. E. D.* A. vesicatoria, *Roxb. Fl. Ind. i, 426 ; W. & A. Prod. 305 ; Royle Ill. 213.* A. indica, *Lamk. ; W. & A. l.c.*

Glabrous. *Stems* erect, 6-8 in. or more. *Leaves* usually opposite, 2-5 in. long, usually narrow but obtuse, narrowed to the base. *Flowers* in very condensed axillary racemes or clusters shorter than the leaves, or in loose but very short axillary cymes ; *bracts* filiform, shorter than the pedicels. *Calyx-tube* widely campanulate ; teeth 4, broadly triangular ; accessory teeth small. *Petals* 0 or very minute. *Capsule* depressed-globose, imperfectly circumsciss above the middle. *Seeds* subhemispheric, black, excavated on the plane face.

In moist places, very common throughout the area. DISTRIB. Throughout Trop. India, extending to Australia and Trop. Africa. The leaves are intensely acrid and are used by natives to raise blisters in the curing of rheumatism and fever.

7. A. salicifolia, *Monti ; D. & G. Bomb. Fl. 97 ; F. B. I. ii, 569.* A. glauca, *Wall. ; W. & A. Prod. 305.*

Glabrous. *Stems* erect, up to 2 ft. high. *Leaves* and branches opposite. Cauline leaves about 2 in. long, sessile, lanceolate, rounded or cordate at the base. *Flowers* densely clustered in the axils. *Calyx* in fruit hemispheric ; teeth 4, erect, triangular, shorter than the capsule, accessory folds small. *Capsule* globose-depressed, reddish. *Seeds* ¼ obovoid, excavated on the plane face, one end much smaller than the other.

Rohilkhand (T. Thomson), Etáwah dist. (Duthie), Banda (Edgeworth). DISTRIB. Punjab Plain, Kumaon up to 4,000 ft., Bengal, W. and S. India ; also in Trop. Africa.

8. A. senegalensis, *Lamk. ; F. B. I. ii, 570 ; Watt E. D.*

Glabrous. *Stems* erect, 6-24 in., branches sharply 4-angular. *Leaves* opposite, sessile, 1-2 in. long, elongate-oblong, subauriculate at the base.

Cymes peduncled, compound ; *bracteoles* minute, linear. *Calyx* campanulate, with 4-8 green lines becoming indistinct in fruit ; teeth 4, broadly triangular. *Petals* 0 or caducous. *Stamens* 6 or 8. *Capsule* $\frac{1}{8}$ in. in diam., globose, exceeding the calyx-tube, red when ripe. *Seeds* half ellipsoid, excavated on the plane face.

Banks of the Gumti in Rohilkhand (Duthie). DISTRIB. Punjab Plain and up to 5,000 ft. on the W. Himalaya ; also in Afghanistan, Persia, Egypt, Trop. Africa and Australia.

9. A. multiflora. *Roxb. Hort. Beng. 11 ; Fl. Brit. Ind. i, 426 ; W. & A. Prod. 305 ; D. & G. Bomb. Fl. 97 ; F. B. I. ii, 570.*

Flowers and capsules smaller than those of *A. senegalensis*, hardly distinguishable otherwise ; yet, as Mr. Clarke observes, the two forms do not pass into each other in India.

Common within the area. DISTRIB. Throughout the plains of India ; also in Afghanistan, Persia and Australia.

2. WOODFORDIA, Linn. ; Fl. Brit. Ind. ii, 572.

Shrubs. *Leaves* opposite, subsessile, entire, lanceolate, pale beneath and gland-dotted. *Flowers* in short panicled cymes on axillary peduncles, rarely solitary, scarlet ; *pedicels* 2-bracteate at their base. *Calyx* long-tubular, slightly curved, mouth oblique ; teeth 6, short, with 6 minute accessory teeth. *Petals* 6, small or 0, inserted at the top of the calyx-tube. *Stamens* 12, declinate, inserted on the calyx-tube below its middle. *Ovary* at the bottom of the calyx-tube, free, sessile, oblong, 2-celled ; *style* filiform, *stigma* small ; *ovules* very many, placentas axile. *Capsule* ellipsoid, membranous, included in the *calyx*. *Seeds* very many, narrowly cuneate-obovate, quite smooth, without hairs or papillæ.—Species 2, one in Abyssinia, and the other Indian extending to Trop. Africa and China.

W. floribunda, *Salisb. ; Brand. For. Fl. 238 ; F. B. I. ii, 572 ; Watt E. D.* Grislea tomentosa, *Roxb. ; Fl. Ind. ii, 233 ; W. & A. Prod. 308 ; D. & G. Bomb. Fl. 97.* *G.* punctata, *Buch.-Ham. ; W. & A. l.c.*—Vern. *Dhawra, dhau, dhenti* (Oudh).

A large shrub with many long arching branches. *Bark* reddish-brown, shredding off in fibres. *Leaves* opposite, subopp., or in whorls of 3, sessile, 2-4 in. long, ovate-lanceolate from a cordate or rounded base, acuminate, entire, usually velvety-pubescent beneath ; lateral nerves 6-12 pairs, prominent beneath and united within the margin. *Flowers* 3-morphic. *Calyx* $\frac{1}{4}$-$\frac{1}{3}$ in. long, bright red. *Petals* about as long as the calyx-segments, white. *Stamens*, much-exserted, *filaments* red, *anthers* versatile. *Capsule* $\frac{1}{2}$ in., inclosed in the persistent calyx-tube, irregularly dehiscent. *Seeds* many, brown, smooth.

Common in all the forest tracts within the area. DISTRIB. Throughout the greater part of India, ascending to 5,000 ft. on the Himalaya ; also in Baluchistan, Trop. Africa, Madagascar and China. Flowers Feb. to April. The flowers and leaves are used in dyeing and tanning, and they as well as the bark are also medicinal. The wood is chiefly used for fuel. The length of stamens and style in this plant vary in a similar manner to that of *Lythrum Salicaria*. (See Oliver's First Book of Indian Botany, p. 213.)

3. LAWSONIA, Linn.; Fl. Brit. Ind. ii, 573.

A glabrous erect shrub with round branches, sometimes spinous. *Leaves* opposite, entire, lanceolate. *Flowers* rather small, in large terminal panicled cymes; *bracts* small, deciduous. *Calyx-tube* exceedingly short; lobes 4, ovate. *Petals* 4, obovate, wrinkled, inserted at the top of the calyx-tube. *Stamens* usually 8, inserted in pairs between the petals, or sometimes only 4. *Ovary* free, 4-celled (or 4-celled at the base); *style* very long, *stigma* capitate; *ovules* many, placentas axile. *Capsule* coriaceous, globose, exsert, irregularly breaking up, ultimately 1-celled. *Seeds* many, angular, pyramidal, smooth, packed on a central placenta.—A single species.

L. alba. *Lamk.; W. & A. Prod. 307; D. & G. Bomb. Fl. 97; Brand. For. Fl. 238; F. B. I. ii, 573; DC. L'Orig. Pl. Cult. 109; Field & Gard. Crops iii, 54; Watt E. D.* L. inermis, *Roxb. Fl. Ind. ii, 258; Royle Ill. 213.*—Vern. *Mehndi.* (Henna).

A shrub about 6 ft. high, with greyish-brown bark and angular branchlets. *Leaves* ¾-1½ in. long, sessile or nearly so, narrow to the base, coriaceous. *Flowers* ¼ in. across, sweet-scented. *Calyx* pinkish; lobes $\frac{1}{12}$ in., ovate, persistent. *Petals* oblong, wrinkled, greenish white. *Capsule* about the size of a pea.

Extensively cultivated within the area as a hedge-plant, and often occurring in a semi-wild state. DISTRIB. Cultivated throughout India, and probably introduced originally from Persia. Flowers during the greater part of the year. The leaves yield a well-known dye, and various parts of the plant are used medicinally. The plant is also prized for the sake of its fragrant flowers.

4. LAGERSTRŒMIA, Linn.; Fl. Brit. Ind. ii, 575.

Trees or shrubs. *Leaves* opposite, distichous (or the uppermost alternate), entire, oblong or ovate. *Panicles* axillary and terminal, usually 3-chotomous; *peduncles* 2-bracteate at their apex; *pedicels* 2-bracteolate. *Flowers* often large. *Calyx-tube* funnel-shaped, smooth grooved angular or subalate; lobes 6 sometimes 7-9, ovate, subacute,

valvate. *Petals* 6 or 7-9 or 0, inserted at the summit of the calyx-tube, clawed, margin crisped erose or fimbriate. *Stamens* very many, inserted near the bottom of the calyx-tube; *filaments* long, exsert. *Ovary* sessile, in the bottom of the calyx, 3-6-celled; *style* long, bent, *stigma* capitate; *ovules* very many, ascending, placentas axile. *Capsule* more or less adnate to the calyx, ellipsoid, coriaceous, smooth, 3-6-celled, 3-6-valved. *Seeds* usually many, elongate, flat, erect, winged from their summit.—Species 23, inhabiting S. E. Asia and Australia, and 1 in Madagascar.

L. parviflora. *Roxb. Cor. Pl. t. 66; Fl. Ind. ii, 505; W. & A. Prod. 308; D. & G. Bomb. Fl. 98; Brand. For. Fl. 239; F. B. I. ii, 575; Watt E. D.*—Vern. *Bakli, dhaura, asidh, sida, adhuari* (Saharanpur), *shej* (Bundelkhand).

A large tree with smooth ash-coloured bark; young parts pubescent. *Leaves* 2-3½ in., opposite, shortly stalked, oblong or ovate, acute or obtusely acuminate, glaucous beneath, glabrous on both surfaces in the typical plant, coriaceous, closely reticulate beneath. *Flowers* ½ in. across, in few- or many-flowered axillary panicles, fragrant; *pedicels* slender. *Calyx* glabrous or pubescent, not ribbed, somewhat funnel-shaped in fruit; teeth triangular, erect in fruit. *Petals* less than ½ in., white. Six of the outermost stamens with longer filaments than the rest. *Capsule* ovoid or cylindrical, ¾-1 in. or more in length, its lower portion immersed in the accrescent woody calyx. *Seeds* (including the terminal wing) ½ in. or more long.

Abundant in all the forest tracts within the area. DISTRIB. Base of the Himalaya from the Jumna to Sikkim and Assam, Cent., W. and S. India, and in Burma. Flowers April to June, and the fruit ripens during the rains, remaining on the tree for a long time. A sweet edible gum exudes from the bark. The inner bark yields a fibre, and the bark and leaves are used in tanning. The hard tough and elastic wood is largely employed for ploughs, boats, etc., and it is said to yield good charcoal.

VAR benghalensis. *Clarke*, in *F.B. I. ii, 576. Leaves* pubescent beneath. *Fruit* smaller, often less than ½ in.; fruiting calyx campanulate.—This variety is chiefly confined to the Sub-Himalayan tracts, extending from Dehra Dun to N. Oudh and Gorakhpur. DISTRIB. Eastward to Nepal, Sikkim, Assam and Burma.

L. Flos-Reginæ, *Retz.* (Vern. *Jarul*) is largely cultivated as an ornamental tree within the area. It grows wild in E. Bengal, Assam, Burma, the Malay Peninsula and in Java. It bears large handsome purple flowers during the rainy season. The timber is highly valued.—L. Indica, *L.*, a shrub with showy pink-white or purple flowers is also much grown in gardens. It is a native of China.

5. PUNICA, Linn.; Fl. Brit. Ind. ii, 580.

Shrubs or small trees, often armed. *Leaves* opposite, sub-opposite or clustered, oblong obovate or (in *P. protopunica*) elliptic, obtuse, entire.

Flowers axillary, solitary or in clusters, sessile or shortly stalked, large, orange-red. *Calyx-tube* funnel-shaped, coriaceous, adnate to the ovary below; lobes 5-7, persistent on the fruit. *Petals* 5-7, inserted between the calyx-lobes, lanceolate, wrinkled. *Stamens* many, inserted round the mouth of the calyx. *Ovary* inferior, with many cells, in two whorls, or in a single whorl in *P. protopunica*; *style* long, *stigma* capitate; *ovules* very many, *placentas* axile in some cells in others parietal. *Berry* inferior, globose or elliptic. *Seeds* many, angular; *testa* coriaceous, with a watery outer coat.—Species 2, one in Socotra and the undermentioned. An anomalous genus allied to *Myrtaceæ* through *Psidium*, and to *Rosaceæ* through *Cydonia*.

P. Granatum, *Linn.; Roxb. Fl. Ind. ii, 400; W. & A. Prod. 327; Royle Ill. 208; Brand. For. Fl. 241; F.B.I. ii, 531; DC. L'Orig. Pl. Cult. 189; Watt E. D.*—Vern. *Anár* (Pomegranate).

A glabrous shrub or small tree, with dark-grey bark. *Branchlets* sometimes spinescent. *Leaves* 1-2½ in. long, oblong or obovate, narrowed to the short petiole, not dotted. Flowering *calyx* about 1 in. long, ⅝ in. broad at its mouth. *Petals* ½-1 in. long, thin, wrinkled, bright red, rarely white or yellowish. *Fruit* 2-3½ in. in diam., globose, with a thick coriaceous reddish-brown rind. Pulp red, or in some varieties white.

Cultivated in gardens within the area. DISTRIB. A native of Afganistan, Baluchistan and Persia, and apparently wild in warm valleys in many parts of the outer W. Himalaya, also in the hilly tracts of the Punjab and Sind. Extensively cultivated in many parts of India, and in the subtropical regions of the whole world. Flowers chiefly in April and May, and the fruit ripens from July to September. The flowers and bark are used in dyeing and tanning, and various parts of the tree are employed medicinally. The fruit is produced in great perfection at Kandahar and other places in Afganistan.

LII.—ONAGRACEÆ.

HERBS, rarely undershrubs, sometimes aquatic. *Leaves* opposite or alternate, entire or toothed, undivided, stipulate in *Trapa*. *Flowers* hermaphrodite, mostly axillary and solitary, or spiked or racemed towards the ends of the branches, subirregular. *Calyx-tube* wholly adnate to the ovary (½-adnate in *Trapa*), limb of 2-5 valvate lobes. *Petals* epigynous, rarely 0. *Stamens* as many or twice as many as the petals, inserted with them. *Ovary* inferior (½-infer. in *Trapa*), 1-6 celled, most often 4-celled; *style* 1, cylindric or subulate; *stigma* capitate or nearly 2-lobed or 4-fid; *ovules* 1 or many in each cell, *placentas* axile. *Fruit* various, dehiscent or indehiscent, 1- or many-celled,

1- or many-seeded. *Albumen* 0 or scanty.—Species about 300, throughout the world, but chiefly in the N. temp. zone.

Fruit capsular, seeds many.	
Calyx-tube not produced beyond the ovary.	
Stamens twice as many as the calyx-lobes .	1. JUSSIEUA.
Stamens as many as the calyx-lobes . .	2. LUDWIGIA.
Calyx-tube much produced beyond the ovary	3. ŒNOTHERA.
Fruit bony, indehiscent, 1-seeded	4. TRAPA.

1. JUSSIEUA, Linn.; Fl. Brit. Ind. ii, 587.

Herbs or undershrubs, growing usually in swamps. *Leaves* alternate, undivided, mostly entire. *Flowers* yellow or white, axillary, solitary; *pedicels* usually 2-bracteate at the apex. *Calyx-tube* scarcely produced above the ovary, linear; teeth 4-6, acute, persistent. *Petals* 4-6, epigynous. *Stamens* double the number of petals, epigynous. *Ovary* inferior, 4-5-celled; *style* simple, usually very short, *stigma* 4-5-lobed; *ovules* many, axile, in several vertical rows at the inner angle of each cell. *Capsule* linear, round or angular, 4-5-celled, 8-10 ribbed, opening septicidally in valves separating from the persistent ribs or irregularly between the ribs. *Seeds* very many, without coma.—Species about 30, in the tropics of the whole world, but chiefly in America.

Stems creeping or floating, petals 5, capsule woody	1. *J. repens.*
Stems erect, petals 4, capsule membranous .	2. *J. suffruticosa.*

1. J repens, *Linn.; Roxb.; Fl. Ind. ii, 401; W. & A. Prod. 336; Royle Ill. 211; D. & G. Bomb. Fl. 98; F. B. I. ii, 587.*

A herb with creeping or floating stems. *Leaves* ½-3 in. long, obvate or oblanceolate, obtuse, narrowed into the petiole, glabrous or sometimes hairy. *Pedicels* usually as long as the capsule. *Petals* 5, rarely 6, about ½ in. long, obovate, white with yellowish veins towards the base. *Capsule* woody, ½-1½ in. long, linear-cylindric, glabrous or with scattered hairs. *Seeds* quadrate, with a white corky reticulated testa.

Common within the area in ponds or on river-banks. DISTRIB. Throughout the plains of India, and in the warmer parts of the whole world. Flowers during the rainy season. The stems, when floating, are supported by means of spongy vesicles developed from below the insertions of the leaves.

2. J. suffruticosa, *Linn.; F. B. I. ii, 587; Watt E. D.* J. exaltata, *Roxb.; Fl. Ind. ii, 401.* J. villosa, *Lamk.; W. & A. Prod. 336; Royle Ill. 211; D. & G. Bomb. Fl. 98.*

An erect perennial branching herb. *Leaves* 2-3 in. long, sessile or nearly so, lanceolate ovate-lanceolate or almost linear, acute or acuminate, narrowed to the base, usually more or less villous. *Flowers* shortly stalked. *Petals* 4, ¼-⅔ in., wholly yellow. *Capsule* 1-2 in. long, linear, cylindric, 8-ribbed, membranous, villous or finally glabrous. *Seeds* subhemispheric; *testa* brown and shining, not corky; *raphe* prominent.

Abundant within the area in wet places. DISTRIB. Throughout the greater part of India, and in the warmer parts of the whole world. Flowers during the rainy season. The plant is used medicinally. A form with very narrow glabrous leaves (J. angustifolia, *Lamk.*) has been found by the author on the banks of the Gumti in Rohilkhand, and by Edgeworth on muddy banks in Bundelkhand.

2. LUDWIGIA, Linn.; Fl. Brit. Ind. ii, 588.

Herbs. *Leaves* alternate, undivided, subentire. *Flowers* usually axillary, solitary, sessile or nearly so; *peduncle* 2-bracteate at the apex. *Calyx-tube* scarcely produced above the ovary, linear in the Indian species; teeth 3-5, acute, persistent. *Petals* 3-5 or 0, epigynous. *Stamens* equal in number to the calyx-segments, epigynous. *Ovary* inferior, 4-5-celled; *style* simple, *stigma* capitate; *ovules* very many, attached in 2 or more vertical rows to the inner angle of each cell. *Capsule* linear or oblong (in the Indian species), 4-5-celled, opening by terminal pores or breaking up irregularly along the sides. *Seeds* many, obovoid, smooth, without coma.—Species 20, mostly N. American, extending to the equator, usually inhabiting marshes.

Capsule oblong, inflated, seeds in several rows in each cell	1. *L. parviflora.*
Capsule narrowly linear, seeds in a single row in each cell	2. *L. prostrata.*

1. L. parviflora, *Roxb.; Fl. Ind. i, 419; W. & A. Prod. 336; D. & G. Bomb. Fl. 99; F. B. I. ii, 588.*

An erect glabrous herb, 8-24 in. high. *Leaves* 1-3 in. long, lanceolate, linear-lanceolate or linear-oblong, narrowed to the base. *Flowers* on short pedicels, usually 4-merous. *Petals* small, yellow. *Capsule* ½-¼ in. long, inflated, obscurely 4-angled. *Seeds* in many rows in each cell, not separately distinguishable through the walls of the capsule.

Common in wet ground. DISTRIB. Throughout the plains of India and in Ceylon, extending to the Malay Penins., Persia, Abyssinia and N. Australia.

2. L. prostrata, *Roxb. Hort. Beng. 11; Fl. Ind. i, 420; F. B. I. ii, 588.* L. diffusa, *Buch.-Ham.; Royle Ill. 211.*

Stems prostrate or decumbent at the base, 8-24 in. long, glabrous. *Leaves* 2-3 in. long, lanceolate or linear-lanceolate, tapering to the base. *Flowers* sessile, 4-merous. *Petals* lanceolate, longer than the calyx. *Capsule*, ½-1 in. long, 4-angled, filiform, crowned by the linear calyx-teeth, rarely inflated, the walls drawn tightly over the seeds so that they can be separately counted. *Seeds* in a single row in each cell.

Dehra Dun (Gamble), Rohilkhand (Duthie). DISTRIB. Assam, Sylhet, Burma, Ceylon, Andaman Islands and Malaya; also in Japan. This greatly resembles the preceding, but the very different capsule and the arrangement of the seeds at once distinguish it.

3. ŒNOTHERA, Linn.

Herbs, rarely undershrubs. *Leaves* alternate, entire toothed or pinnati-fid. *Flowers* axillary, solitary or in leafy spikes or racemes, regular, hermaphrodite, often very showy. *Calyx-tube* linear or clavate, 4-gonous, produced above the ovary, limb 4-lobed, deciduous. *Petals* 4. *Stamens* 8, equal or the alternate ones shorter; *anthers* linear. *Ovary* 4-celled; *style* filiform, *stigma* capitate, entire or 4-lobed; *ovules* many, inserted at the inner angle of the cells in 1-2 series, horizontal or ascending. *Capsule* usually 4-celled, oblong or clavate, 4-gonous and sometimes winged, splitting from the apex into 4 septiform valves or indehiscent. *Seeds* usually many.—Species upwards of 100, inhabiting chiefly temp. N. and S. America.

Œ. **rosea**, *Soland.; F. B. I. ii, 582.*

An erect herb about 1 ft. high. *Stems* somewhat woody at the base, terete, pubescent, reddish. *Leaves* ovate, narrowed at both ends, toothed, often lyrate, prominently veined. *Flowers* solitary in the axils. *Petals* orbicular, pink with darker coloured veins. *Capsule* ¼-½ in. long, clavate, sharply angled, puberulous.

A native of Peru. Its introduction to India must have taken place within a comparatively recent period, as neither Roxburgh, Royle or Wight have alluded to the plant. It has now completely established itself as an abundant weed on the outer ranges of the W. Himalaya, as well as on the Nilgiri Hills. It also occurs in Dehra Dun.

4. TRAPA, Linn.; Fl. Brit. Ind. ii, 590.

Aquatic herbs. *Stems* long, flexuose, ascending in the water, the more submerged portions giving off at intervals pairs of green pectinate spreading organs from below the margins of the scars of fallen leaves. *Leaves* floating, alternate, approximate in the form of rosettes, rhomboidal, the petiole with a spongy dilatation near its apex. *Stipules* small, caducous. *Flowers* axillary, solitary, pedunculed. *Calyx-tube* short, adnate to the lower part of the ovary; limb

4-partite, 2 or all the segments persistent and becoming spinescent on the fruit. *Petals* 4, small, white, inserted at the margin of an epigynous disk. *Stamens* 4. *Ovary* ½-inferior, with a conical vertex, 2-celled; *style* subulate, *stigma* capitate; *ovules* solitary in each cell, pendulous from the upper inner angle. *Fruit* bony, 1-celled, obovoid, with 4 angles, 2 or all of which carry spines, indehiscent, with a short cylindric beak at the top through which the radicle is protruded. *Seed* 1, inverse; *cotyledons* very unequal.—Species 3, inhabiting C. and S. Europe and the tropical and subtropical regions of Asia and Africa.

This genus has been placed by some of the more recent authors in a separate natural order called Hydrocaryaceæ. (See Raimann in Engler and Prantl Pflanzenf., Vol. iii, part 7, p. 223). Trimen in his Flora of Ceylon, part ii, p. 236, following Roxburgh, maintains that the peculiar pectinate organs borne by the submerged stems must, owing to their position, be considered as appertaining to stipules rather than leaves.

T. bispinosa, *Roxb. Cor. Pl. 234; Fl. Ind. i, 428; W. & A. Prod. 337; Royle Ill. 211; D. & G. Bomb. Fl. 99; F. B. I. ii, 590; Watt E. D.; Field & Gard. Crops, part iii, 3, t. xcviii.*—Vern. *Singhára.*

Leaves 2 by 2½-3 in., crowded in the upper part of the stem, often somewhat 3-lobed, usually very villous beneath, posterior margin entire, anterior crenate or serrate; upper surface glabrous, shining, dark-green and often mottled with brown, woolly and reddish-purple beneath; *stipules* linear, membranous, caducous; flowering *petiole* short, elongating in fruit to 4 in. or more, upper dilated portion woolly. *Fruit* turbinate, ripening under water, 1-1½ in. long and broad, dark-brown, two opposite angles each with a scabrous spine, the two others sometimes obsolete.

Abundant in jhils and tanks within the area, often cultivated. DISTRIB. Throughout India and in Ceylon, also in S. E. Asia and Trop. Africa. Flowers in the rainy season, and the fruit ripens during the cold weather. The *singhára* nut is largely eaten either cooked or raw, especially by Hindus. It constitutes an important item of food-material during times of scarcity.

VAR. incisa, *Wall.* *Leaves* much smaller and less villous beneath, dentate or incise-dentate towards the apex; *petiole* glabrescent. *Fruit* ½ in. broad, the 4 angles all spinescent, but the 2 lateral spines shorter.

LIII.—SAMYDACEÆ.

TREES or shrubs. *Leaves* alternate, often distichous, usually petioled, simple, entire or slightly crenate or serrate, often closely punctulate beneath; stipules small, deciduous. *Flowers* regular,

small, axillary, shortly pedicelled, densely fascicled or in long simple or panicled racemes. *Calyx* coriaceous, persistent; tube short, free, or longer and adnate to the base of the ovary; limb 3-7-fid. *Petals* as many as the calyx-lobes or 0, perigynous, imbricated. *Stamens* few or many, often with staminodes between or united in a tube with them. *Ovary* superior or ½ superior, 1-celled; *style* 1, capitate or 2-fid., or styles 2-5; *ovules* usually many; *placentas* usually 3, parietal. *Fruit* loculicidally 2-5- (usually 3-) valved, valves carrying the seeds on the medial line. *Seeds* many or few, oblong or annular, *albumen* usually drilled.—Species about 180, mostly in tropical regions of the globe, rarely in the subtropical.

CASEARIA, Jacq.; Fl. Brit. Ind. ii, 591.

Shrubs or small trees. *Leaves* alternate, distichous, petioled, undivided, entire or slightly serrate, often minutely punctate beneath; *stipules* small, lateral, caducous. *Flowers* small, greenish-yellow, clustered in the axils (in the Indian species); *pedicels* short, jointed above their base, surrounded by small scales. *Calyx* inferior, deeply 4-5-lobed; lobes imbricate, obtuse, persistent. *Petals* 0. *Stamens* usually definite, united in a tube with staminodes alternating with the free portion of the filaments; staminal tube hypogynous, sometimes very short. *Ovary* free, ovoid, 1-celled; *style* simple; *stigma* capitate or 3-fid; *ovules* many, parietal. *Capsule* succulent, globose or ovoid, ellipsoid, somewhat 3-angular or 6-ribbed when dry, 3- rarely 2-valved. *Seeds* many, angular or obovoid with a fleshy usually coloured aril.—Species 140, in the warmer parts of the whole globe, especially in America.

Leaves glabrescent, stipules about ¼ in. long	1. *C. graveolens.*
Leaves tomentose, stipules minute	2. *C. tomentosa.*

1. C. graveolens. *Dalz.; D. & G. Bomb. Fl. 11; Brand. For. Fl. 243; F. B. I. ii, 592; Watt E. D.*—Vern. *Chilli, nara* or *narha* (Dehra Dun), *naro* (Bijnor).

A shrub or small tree, with dark-grey bark speckled with white; *branchlets* glabrous. *Leaves* 4-8 in. long, shortly stalked, elliptic, obtuse or shortly acute, rounded or acute at the base, crenate, glabrescent; *stipules* about ¼ in. long, deciduous. *Flowers* clustered in the axils of the leaves, fœtid; *pedicels* jointed near the base, pubescent below the joint, glabrous above. *Calyx* 5-lobed, pubescent at the base. *Stamens* 8, alternating with hairy scale-like staminodes. *Capsule* ½ in., 3-valved, ellipsoid, glabrous, shining, 12-seeded.

Forests of Dehra Dun and Saharanpur, Rohilkhand, N. Oudh and Gorakhpur. DISTRIB. Westward to Chenab, ascending to 5,000 ft., Garhwal-Himalaya east to Sikkim, W. Deccan, Burma. Flowers during May and June. The fruit is sometimes used for poisoning fish.

2. C. tomentosa, *Roxb. Fl. Ind. ii, 421 ; Royle Ill. 170 ; Brand. For. Fl. 243, t. xxx ; F. B. I. ii, 593, Watt E. D.* C. Anavinga, *D. & G. Bomb. Fl. 11.* C. ovata, *Roxb. Fl. Ind. ii, 420 (not of Willd.).*—Vern. *Chilla.*

A small tree. *Bark* light-grey turning to dark-brown. *Branchlets* usually tomentose. *Leaves* 3-7 in., shortly petioled, oblong or lanceolate from an oblique rounded or acute base, crenate serrate or almost entire, subcoriaceous, more or less tomentose, sparsely gland-dotted ; *stipules* minute. *Flowers* numerous, small, fascicled in the axils of the leaves, greenish-yellow, tomentose ; *pedicels* less than ¼ in., hairy. *Stamens* 8, alternating with hairy scale-like staminodes. *Fruit* ½-¾ in., 3-valved, broadly ellipsoid, fleshy, yellow when ripe. *Seeds* embedded in red pulp.

Common in all the forest tracts. DISTRIB. Throughout India from the base of the Himalaya to Ceylon ; also in the Malay Islands and N. Australia. Flowers March to May. The bitter bark is sometimes used for adulterating *Kamela* powder (Mallotus philippinensis). The acrid milky juice of the pounded fruit is employed as a poison for fish. From the hard close-grained wood combs are made.

LIV.—CUCURBITACEÆ.

CLIMBING herbs or shrubs ; *tendrils* solitary, lateral, spiral, simple or divided. *Leaves* alternate, petioled, frequently cordate, simple lobed or pedately divided. *Flowers* monœcious or diœcious, yellow or white, racemed and solitary, less frequently panicled. *Calyx-tube* wholly adnate to the ovary (except in *Actinostemma*) ; limb rotate campanulate or tubular, lobes 5 (rarely 3), imbricate. *Petals* 5, inserted on the calyx-limb, united in a tube or nearly or quite free, sometimes fimbriated at the margin, valvate or involute in bud. *Stamens* inserted at the mouth or about the middle or at the base of the calyx-tube, usually 3 (sometimes 5 or 2) ; *anthers* free or united in a tube, one usually 1-celled and the other two 2-celled ; cells straight flexuose or conduplicate, the connective sometimes crested or produced. *Ovary* inferior (in *Actinostemma* ½-superior), usually 3-carpellary, sometimes spuriously 3-celled ; *style* usually with 3 stigmas ; *placentas* usually 3, vertical, in double lines ; *ovules* usually many, horizontal, rarely pendulous. *Fruit* generally berried or fleshy, indehiscent or dehiscing by valves or by a stopple. *Seeds* usually many, often compressed, horizontal pendulous or rarely erect, frequently corrugated or subspinose on the margins, albumen 0.—Species about

600, spread over the warmer parts of the world, especially in the tropics.

A. Stamens 3 (5 in *Luffa ægyptiaca* and *Thladiantha*); fem. flowers usually solitary, ovules horizontal (pendulous in *Herpetospermum*).

Anther-cells conduplicate or flexuose.

Corolla divided nearly or quite to the base.
Petals fimbriate . . . . . 1. TRICHOSANTHES.

Petals entire.

Calyx-tube of male flower elongate, anthers included.

Fruit 3-valved almost to base, seeds pendulous . . . . . 2. HERPETOSPERMUM.

Fruit indehiscent, seeds horizontal . 3. LAGENARIA.

Calyx-tube of male flower short, anthers usually more or less exserted.

Stamens inserted near the mouth of cal.-tube.

Male flowers (partly) in racemes, ripe fruit dry and usually circumsciss near the apex . . 4. LUFFA.

Flowers all solitary; fruit fleshy, indehiscent . . . . 5. BENINCASA.

Stamens inserted below the mouth of cal.-tube.

Male flowers (partly) racemed, tendrils simple . . . . 6. MOMORDICA.

Male flowers clustered or solitary, tendrils simple . . . 7. CUCUMIS.

Flowers all solitary, tendrils 2-3-fid. . . . . 8. CITRULLUS.

Corolla campanulate, divided about ¼ way down.

Tendrils simple, flowers white . . 9. COCCINIA.

Tendrils divided, flowers yellow . . 10. CUCURBITA.

Anther-cells straight (somewhat curved in *Bryonopsis*).

Style with an annular disk at the base . 11. MELOTHRIA.

Style without a disk at the base.

Flowers small, monœcious, pale-yellow.

Petiole with a stipule-like ciliate bract in the axil . . . . . 12. BLASTANIA.

Petiole with no stipule-like bract in the axil.

Fruit ovoid, rostrate, circumsciss near the base . . . . 13. CORALLOCARPUS.

Fruit a round berry, bluish-green with white stripes . . . 14. BRYONOPSIS.

Flowers large, dicœcious . . . 15. THLADIANTHA.

B. Stamens 5, free, anthers straight; flowers small, moncœcious, the females in racemes; ovules 2-4, pendulous . . . . 16. ACTINOSTEMMA.

1. TRICHOSANTHES, Linn.; Fl. Brit. Ind. ii, 606.

Scandent herbs. *Leaves* entire or 3-9-lobed, denticulate; *tendrils* usually 2-5-fid. *Flowers* usually dicœcious, white; *male peduncles* usually in axillary pairs, one 1-flowered, caducous, the other racemose; *bracts* large or small or 0; *female flower* solitary. MALE: *Calyx* long tubular; teeth 5, lanceolate, entire serrate or laciniate. *Corolla* 5-fid nearly to the base, lobes long fimbriate. *Stamens* 3; *anthers* almost included, connate (free in *T. dioica*), linear, one 1-celled, two 2-celled, cells conduplicate. FEMALE: Calyx and corolla as in male. *Ovary* inferior, at the base of the calyx-tube, 1-celled; *style* filiform, 3-or 6-fid. at apex; *placentas* 3, parietal; *ovules* very many, horizontal, ½-pendulous. *Fruit* fusiform, ovoid or globose, smooth, acute or obtuse at the apex. *Seeds* many, horizontal, packed in pulp, compressed, ellipsoid, sometimes angular on the margin. —Species 38, in S. E. Asia, extending through Malaya to China and Japan.

Male flowers in racemes.

Bracts of male flowers large, and sheathing at the base, fruit globose, red striped with orange.

Bracts laciniate . . . . . 1. *T. palmata.*

Bracts entire . . . . . 2. *T. cordata.*

Bracts of male flowers large, not sheathing; fruit cylindric . . . . . 3. *T. himalensis.*

Bracts of male flowers minute or 0.

Male racemes ebracteate, fruit globose, pulp orange . . . . . 4. *T. dicœlosperma.*

Male racemes ebracteate, fruit ovoid-conical, pulp red . . . . . 5. *T. cucumerina.*

Male racemes with minute bracts, fruit elongate cylindric . . . . . 6. *T. anguina.*

Male flowers solitary; fruit oblong, red . 7. *T. dioica.*

1. T. palmata, *Roxb.; Fl. Ind. iii, 704; W. & A. Prod. 350; D. & G. Bomb. Fl. 103; F. B. I. ii, 606; Watt E. D.* T. bracteata, *Voigt; Cogn. in DC. Mon, Phan. iii, 375.*—Vern. *Lal indrayan.*

An extensive climber, with stout branching sulcate glabrescent stems; *tendrils* usually 3-fid. *Leaves* 2-5 in. in diam., ovate or suborbicular in outline, usually 3-7-lobed to the middle, deeply cordate, dark-green and scabrous above; lobes ovate oblong or sublinear, entire toothed or deeply lobulate; *petiole* 1-3 in. *Male racemes* few-flowered; *bracts* ovate, sheathing the flowers from a broad base, deeply cut. *Calyx-tube* narrowed to the base; teeth lanceolate, denticulate. *Fruit* 1¼-2 in. in diam., globose, bright-red streaked with orange. Seeds many, immersed in green pulp.

Common within the area. DISTRIB. Throughout India to Ceylon, ascending to 5,000 ft. on the Himalaya; also in Malaya, China, Japan and N. Australia. Flowers in the hot season, and the fruit ripens during the rains. The fruit and root are medicinal. The former, when raw, is poisonous, and is often used mixed with rice for destroying crows.

2. T. cordata, *Roxb. Fl. Ind. iii, 703; F. B. I. ii, 603; Watt E. D.; Cogn. in DC. Mon. Phan. iii, 367.*

An extensive climber, with large tuberous roots and stout branching stems; *tendrils* usually very stout, 3-fid. *Leaves* 6-8 in., entire or obscurely angular, broadly ovate-cordate, acute or shortly acuminate, dentate-serrate, dark-green above, and with short scattered hairs on both surfaces; *petiole* 2-4 in., stout. *Male racemes* few-flowered; *bracts* large, elongate, sheathing at the base, obovate, entire, pubescent. *Calyx-tube* 1½ in., hairy; lobes acuminate, denticulate. *Fruit* as in *T. palmata.*

Dehra Dun (Duthie), Hardwar (King). DISTRIB. Along the base of the Himalaya from Nepal eastwards; also in Bengal and Burma. The tuberous root and the flowers are medicinal.

3. T. himalensis, *Clarke in F. B. I. ii, 603; Cogn. in DC. Mon. Phan. iii, 379.*

An extensive climber, with slender branching sulcate hairy stems; *tendrils* 3-fid. *Leaves* about 5 in. in diam., nearly circular in outline, palmately 3-5-lobed, deeply cordate, irregularly serrate, roughish above, villous or pubescent beneath; lobes lanceolate, shortly acuminate. *Flowers* dioecious. *Male peduncles* 3-4 in.; *bracts* ½-¾ in., narrowed to the base, not sheathing, lanceolate, incise-serrate. *Calyx-tube* 1½-2 in., very narrow, slightly hairy. *Fruit* 3-4 in. long, long-cylindric, tapering at both ends. *Seeds* turgid, obovoid or drum-shaped.

Kheri dist. in N. Oudh (Duthie's collector). DISTRIB. Sikkim.

4. T. dicælosperma, *Clarke in F. B. I. ii, 609; Cogn. in DC. Mon. Phan. iii, 381.*

Stems long, twining, sulcate, puberulous; *tendrils* 2-fid. *Leaves* about 4 in. long, cordate-ovate, acute, minutely denticulate, softly pubescent on both surfaces; *petiole* 1½ in., densely villous. *Flowers* dicœcious. *Male peduncles* in pairs, one early and 1-flowered, the other 2-3 in. long and racemed; *bracts* minute or 0. *Calyx-tube* 1¼ in., narrow, pubescent; teeth spreading, subulate. *Fruit* globose, 1½ in. in diam., pubescent, with 10 pale vertical bands. *Seeds* pale-grey, embedded in orange pulp, 3-celled, the lateral cells empty.

Dehra Dun (King). DISTRIB. Sikkim 2—5,000ft., Khasia Hills up to 4,000 ft.

5. T. cucumerina, *Linn.; Roxb. Fl. Ind. iii, 702; W. & A. Prod. 350; Royle Ill. 219; D. & G. Bomb. Fl. 102; F. B. I. ii, 609; Watt E. D.; Cogn. in DC. Mon. Phan. iii, 359.* T. lobata, *Roxb. Fl. Ind. iii, 703.*—Vern. *Jangli chichinda.*

Stems twining, branched, more or less pubescent; *tendrils* 2-3-fid. *Leaves* 2-4 in. in diam., suborbicular or reniform in outline, usually 5-lobed or-angular; lobes obtuse or acute, denticulate, hairy on both surfaces; *petiole* ¾ in. *Male peduncles* in pairs, the earlier 1-flowered, the other racemed, occasionally in place of the earlier is found a female. *Calyx-tube* narrowed to the base, puberulous; teeth short, subulate. *Fruit* 1-3 in. long, ovoid-conical, at first glaucous streaked with white, turning to yellow when ripe. *Seeds* about ¾ in. long, embedded in red pulp, ½-ellipsoid, compressed, corrugate.

Common within the area, and often found on hedges. DISTRIB. Throughout India and in Ceylon; also in the Malay Penins. and Islands, and in N. Australia. Various parts of the plant are used medicinally. The fruit, which ripens during the rains, is largely eaten as a vegetable, and the young tops as a potherb.

6. T. anguina, *Linn.; Roxb. Fl. Ind. iii, 701; W. & A. Prod. 350; F. B. I. ii 610; Cogn. in DC. Mon. Phan iii, 359; DC. L'Orig. Pl. Cult. 217; Field & Gard. Crops, part ii, 45. t. xlvi; Watt E. D.*—Vern. *Chachinda* (Snake gourd).

This resembles the preceding species almost exactly except as regards the fruit, which differs chiefly in being very variable both as to shape and size. It varies from 1-3 ft. in length, and is often much contorted. When young it is green striped with white, changing to a bright orange colour when ripe.

Extensively cultivated within the area and throughout the hotter parts of India and in China. As suggested by Mr. Clarke, it is in all probability only a cultivated form of *T. cucumerina*. The fruit is largely eaten as a vegetable, and is sometimes sliced and cooked so as to resemble French beans.

7. T. dioica, *Roxb. Hort. Beng. 70; Fl. Ind. iii, 701; Royle Ill. 219; F. B. I. ii. 609; Cogn. in DC. Mon. Phan. iii, 385; Field & Gard. Crops part iii, 23; Watt E. D.*—Vern. *Palwal.*

Stems slender, extensively climbing, more or less scabrous and woolly; tendrils 2-4-fid. *Leaves* 3 by 2 in., ovate-oblong, cordate, acute, sinuate-dentate, not lobed, rigid, rough on both surfaces; *petiole* ½ in. *Flowers* dicœcious. *Male flowers* not racemed, woolly outside. *Calyx-tube* 1½ in., narrow; teeth linear, erect. *Anthers* free. *Fruit* 2-3½ in., oblong or nearly spherical, acute, smooth, orange-red when ripe. *Seeds* ½-ellipsoid, compressed, corrugated on the margin.

Common within the area, both wild and cultivated. DISTRIB. Throughout the plains of N. India extending to Assam and E. Bengal. It is grown during the rainy season, and the fruit, which is cooked in a variety of ways, is considered to be a very wholesome vegetable. The root, leaves and the juice of the fruit are used medicinally.

2. HERPETOSPERMUM, Wall.; Fl. Brit. Ind. ii, 613.

Extensively scandent, *tendrils* 2-3-fid. *Leaves* long-petioled, cordate, ovate, little lobed. *Flowers* large, yellow, dicœcious; males frequently on two peduncles from one axil, one early deciduous 1-flowered, the other racemose without bracts; females solitary on very short peduncles. MALE: *Calyx-tube* elongate, cylindric at the base, above narrow and funnel-shaped; teeth 5, long, linear; *petals* 5, elliptic, nearly separate, entire; *stamens* 3; *anthers* connate, included, one 1-celled, two 2-celled, cells conduplicate. FEMALE: *Calyx and corolla* as in the male. *Ovary* oblong, 3-celled; *style* long, with three oblong bifid stigmatic lobes; *ovules* pendulous, 4-6 in each cell. *Fruit*, broad-oblong, narrowed at both ends, 3-angular, irregularly sinuate-costate; valves 3, separating from the axis nearly to the base. *Seeds*, in 2 rows in each cell, flat, oblong, pendulous, the lower end corrugate or almost 3-lobed.—A single species.

H. caudigerum, *Wall. Cat. 6761; F. B. I. ii, 613; Cogn. in DC. Mon. Phan. iii, 404.*

Stem slender, angled, more or less pubescent. *Leaves* 4-6 in. in diam. acuminate, crenate-dentate, sparingly pubescent on both sides, or almost glabrous; *petiole* 2-4 in. *Male peduncle* 8 in.; *pedicels* 1 in., ebracteate, villous. *Calyx-tube* about 1 in., pubescent; teeth erect, subfiliform. *Petals* acute, gland.-punctate outside. *Anthers* included in the calyx-tube. Rudiment of ovary in male-flower linear. *Fruit* 3 by 1½ in., 3-valved almost to the base, sparingly pubescent. *Seeds* 12-18, in fibrous juiceless pulp, ½ in. long, pale-brown.

Dehra Dun (King). DISTRIB. Temp. Himalaya from Simla to Bhutan, and on the Khasia Hills.

3. LAGENARIA, Seringe; Fl. Brit. Ind. ii, 613.

Large pubescent climbers; *tendrils* 2-fid. *Leaves* ovate or orbicular, cordate, dentate; *petiole* long, with 2 glands at its apex.

Flowers large, white, solitary, monœcious or dicœcious, the males long—the females short-peduncled, MALE: *Calyx-tube* funnel-shaped, subcampanulate; teeth 5, narrow. *Petals* 5, free, obovate. *Stamens* 3; *anthers* connate, included, one 1-celled, two 2-celled, cells conduplicate; rudiment of ovary 0. FEMALE: *Calyx and corolla* as in the male. *Ovary* oblong; *style* short, with 3 bifid stigmatic lobes; *ovules* many, horizontal; *placentas* 3, vertical. *Fruit* large, ultimately thick membranous or almost woody, indehiscent, polymorphous, usually broader upwards. *Seeds* very many, horizontal, compressed, with a marginal groove, smooth.—A single species.

L. vulgaris, *Ser.; W. & A. Prod. 341; Royle Ill. 218; F. B. I. ii, 613; Cogn. in DC. Mon. Phan. iii, 417; DC. L'Orig. Pl. Cult. 195; Field & Gard. Crops part ii, 43, t. xlviii; Watt E. D.* Cucurbita Lagenaria, *Linn.; Roxb. Fl. Ind. iii, 718.*—Vern. *Kaddu, alkaddu, lauki, gol kaddu, tumri* (small wild form). Bottle gourd.

A softly pubescent climbing or trailing herb, with stout 5-angled stems. *Leaves* often 6 in. in diam., 5-angular or 5-lobed, hairy on both surfaces. *Petals* 1-2 in long, crumpled, hairy on both sides. *Ovary* softly pubescent. *Fruit* usually bottle- or dumbbell-shaped. *Seeds* ⅝-¾ in., white.

This gourd is cultivated within the area during the rainy season, and throughout India, as well as in America, Australia and China. According to DeCandolle it is indigenous in India, the Moluccas and in Abyssinia. The fruit, when young, is boiled and used as vegetable marrow, or it is sliced and cooked in curries, or cut into strips and boiled to resemble French beans. The dried shell of the bottle-shaped fruit is much used for holding water, and that of the wild kind (*tumri*) is made into the stringed instrument known as the *sitar*. The leaves, the pulp of the fruit and the seeds are medicinal.

4. LUFFA, Cav.; Fl. Brit. Ind. ii, 614.

Climbers, large or small, pubescent or nearly glabrous; *tendrils* 2-5-fid. *Leaves* cordate, usually 5-angular or 5-lobed; *petiole* without glands at its apex. *Flowers* yellow or white, monœcious, males and females often from the same axil; females solitary or panicled, males on long or short racemes or clustered. MALE: *Calyx-tube* top-shaped; lobes 5, triangular or lanceolate. *Petals* 5, obovate. *Stamens* 3, rarely 5, *filaments* 3, free or connate; *anthers* exserted, free, one 1-celled, the others 2-celled, cells sigmoid, often on the margin of the broad connective. FEMALE: *Calyx-tube* shortly produced above the ovary; lobes and corolla as in the male. *Ovary* oblong; *style* cylindric, *stigma* 3-lobed; *ovules* very many, horizontal. *Fruit* large or small, oblong (not spherical), smooth or angular or spinous, ultimately fibrous, not succulent, 3-celled, usually circumscissile near the top. *Seeds* many, oblong, compressed.—Species about 7, in the warmer regions

of the Old World, some of them widely cultivated, and one indigenous in America.

Fruit smooth.	
Stamens 5, fruit not ridged	*1. L. ægyptiaca.*
Stamens 3, fruit sharply 10-ridged . .	*2. L. acutangula.*
Fruit densely bristly	*3. L. echinata*

1. L. ægyptiaca, *Mill.; F. B. I. ii, 614; Field & Gard. Crops part ii, 61, t. xiii; Watt E. D.* L. pentandra, *Roxb.; Fl. Ind. iii, 712; W. & A. Prod. 343; Royle Ill. 218.* L. clavata, *Roxb. l.c. 714.* L. racemosa, *Roxb. l.c. 715.* L. acutangula *W. & A. l.c.* (not of Roxb.). L. cylindrica, *Rœm.; Cogn. in D.C. Mon. Phan. iii, 456; DC. L'Orig. Pl. Cult. 214.*—Vern. *Ghiya taroi.*

Extensively climbing, *tendrils* 3-fid. *Leaves* 4 in. in diam., reniform-orbicular, 5-angled or 5-lobed, dentate, usually scabrous, punctate on both surfaces; *petiole* 2 in. *Male flowers* approximate at the summit of long peduncles; *pedicels* usually short, each with a small ovate entire viscid bract. *Petals* ½-1 in., deep-yellow, often with elevated hairy green veins. *Stamens* 5. *Female flowers* solitary, *peduncle* 1-3 in. *Fruit* 5-12 in. elongate, clavate, smooth, obscurely 10-ribbed. *Seeds* ⅜ in. long, narrowly winged, usually black, smooth or slightly tubercled.

Cultivated within the area during the rainy season and throughout the greater part of India, as well as in Africa and America. It is believed to be indigenous in India, in the Indian Archipelago and in N. Australia. The young fruit is much eaten as a vegetable. When dry it becomes filled with a network of fibres, and is then used as a flesh-brush.

2. L. acutangula, *Roxb. Hort. Beng. 70; Fl. Ind. iii, 713; Royle Ill. 218; F. B. I. ii, 615; DC. L'Orig. Pl. Cult. 215; Field & Gard. Crops part ii, 60, t. lxii; Watt E. D.; Cogn. in DC. Mon. Phan. iii, 459.*—Vern. *Kâli taroi, kali tori, satpatiya* (Bundelkhand).

Very similar in many respects to the preceding species, but differing chiefly by having only 3 stamens, and by its smaller and acutely 10-angled fruit.

This plant is much cultivated during the rainy season within the area, and throughout the greater part of India, as well as in other tropical countries. DeCandolle considered it to be indigenous in India and in the Malay Archipelago. The young fruit is a much esteemed vegetable. The seeds, leaves and roots are used medicinally.

VAR. amara, *Clarke in F. B. I. l.c.; Cogn. l.c.* L. amara, *Roxb.; Fl. Ind. iii, 715; W. & A. Prod. 343; D. & G. Bomb. Fl. 102.*—*Leaves* smaller, whitish, softly villous, and at length scabrous. *Fruit* ovoid or oblong; ribs not prominently winged. *Seeds* smaller.—Merwâra. DISTRIB. Greater part of India, especially on the Western side.—Every part of the plant is intensely bitter, and possesses important medicinal properties.

3. L. echinata, *Roxb. Hort Beng. 104; Fl. Ind. iii, 716; W. & A. Prod. 343; D. & G. Bomb. Fl. 102; F. B. I. ii, 615; Cogn. in DC. Mon. Phan. iii.*

464; L. Bindaal, *Roxb.*; *Fl. Ind. iii, 717*; *Royle Ill. 219.*—Vern, *Khaksi* (Oudh).

Stems not extensively climbing, scabrous-pilose at the nodes; *tendrils* 2-fid. *Leaves* 1-2 in. in diam., reniform-orbicular, entire or obscurely 5-angled or lobed, or deeply cut into 5 narrow sinuate pinnatifid denticulate segments, scabrous on both sides, pale-green; *petiole* 1-2 in. *Male peduncles* usually paired, one 1-flowered, the other supporting a long raceme. *Flowers* small, white, usually dioecious, without bracts. *Calyx-teeth* persistent. *Stamens* 3, two with 2-celled anthers. *Peduncle* of solitary fem. flower very short. *Fruit* 1¼ in. long, ovoid, not ribbed, densely covered with stiff ciliate bristles except at the operculate apex. *Seeds* many, slightly scabrous.

Dehra Dun, N. Oudh, Bundelkhand. DISTRIB. Sind, Gujarat, Bengal, Burma; also in Abyssinia and Trop. Africa. The bitter fruit is considered to be a remedy for dropsy.

VAR. longistyla, *Clarke in F. B. I. l.c. Cogn. l.c. 465.* L. longistyla, *Edgew.* Male racemes shorter than the leaves. Spines of fruit fewer, glabrous Banda (Edgeworth). Edgeworth remarks that the bitter fruits are sold in bazars as a horse medicine.

5. BENINCASA, Savi.; Fl. Brit. Ind. ii, 616.

A large trailing or climbing gourd, softly hairy; *tendrils* 2-fid. *Leaves* cordate, reniform-obricular, more or less deeply 5-lobed; *petiole* without glands. *Flowers* large, yellow, monœcious, all solitary, without bracts. MALE: *Calyx-tube* campanulate; lobes 5, leaflike, serrate. *Petals* 5, nearly separate, obovate. *Stamens* 3, inserted near the mouth of the tube; *anthers* exsert, free, one 1-celled, two 2-celled, cells sigmoid. FEMALE: *Calyx* and *corolla* as in the male. *Ovary* oblong, densely hairy; *style* thick, with 3 flexuose stigmas; *ovules* numerous, horizontal; *placentas* 3. *Fruit* large, fleshy, oblong, pubescent, indehsicent. *Seeds* many, oblong, compressed, margined.—A single species.

B. hispida, *Cogn. in DC. Mon. Phan., iii, 513*; *DC. L'Orig. Pl. Cult. 213.* Cucurbita Pepo, *Lour.*; *Roxb. Fl. Ind. iii, 718* (*not of Linn.*) Beninkasa cerifera, *Savi*; *W. & A. Prod. 344*; *F. B. I. ii, 616*; *Field & Gard. Crops part ii, 43, t. XLV*; *Watt E. D.*—Vern. *Petha* (Saharanpur), *Kumhra* (Cawnpore), *Kundha* (Allahabad). THE WHITE GOURD-MELON.

Stems stout, angular, hispid. Leaves 4-6 in. in diam., hispid beneath; *petiole* 3-4 in. Male peduncle 3-4 in.; female peduncle shorter. *Calyx-teeth* when young often narrow and scarcely serrate. *Filaments* angular, hispid at the base. *Fruit* 1-1½ ft. long, broadly cylindric, not ribbed, hairy, ultimately covered with a waxy bloom.

Sparingly cultivated within the area, and chiefly in highly manured village land. It is grown also in the Punjab plain and in Bengal. The fruit, which is very much like the *pumpkin* (Cucurbita Pepo), is often

eaten as a vegetable, and in some places, as at Saharanpur, it is largely made use of by confectioners in the preparation of a sweetmeat called *heshim*. The fruit and seeds are medicinal.

6. MOMORDICA, Linn.; Fl. Brit. Ind. ii, 616.

Climbing, with simple tendrils. *Leaves* cordate, petioled, undivided in the Indian species. *Flowers* yellow or white, monœcious or dicœcious; *females* solitary, peduncled; *males* solitary or racemed, bracteate or not. MALE: *Calyx-tube* short, campanulate; lobes 5. *Corolla* 5-partite nearly to base. *Stamens* 3 (2 in M. Cymbalaria); *filaments* short; *anthers* at length free, one 1-celled, one or two 2-celled, cells conduplicate, or in *M. Cymbalaria* horseshoe-shaped. FEMALE: *Calyx* and *corolla* as in the male. *Ovary* oblong; *style* long, *stigmas* 3; *ovules* very many, horizontal; *placentas* 3. *Fruit* oblong or spherical, rough or smooth, indehiscent or 3-valvate, many- or few-seeded. *Seeds* obovate or complanate, smooth, corrugate or sculptured.—Species 25, in Trop. Asia, Africa and America.

Flowers monœcious.

Bract of male flower attached to the middle or towards the base of the peduncle	1. *M. Charantia.*
Bract of male flower at the apex of peduncle	2. *M. Balsamina.*

Flowers dicœcious.

Petals yellow	3. *M. dioica.*
Petals white	4. *M. cochinchinensis.*

1. M. Charantia, *Linn.; Roxb. Fl. Ind. iii, 707; W. & A. Prod. 348; Royle Ill. 219; D. & G. Bomb. Fl. 102; F. B. I. ii, 616; Cogn. in DC. Mon. Phan. iii, 436; Field & Gard. Crops part ii, 62, t. LXIV Watt E. D.* M. humilis, *Wall.; Royle l.c. 218.* M. muricata, *DC.; Royle; l.c. 219.*—Vern. *Karela, kareli.*

Stem 3-6 ft. long, branching, pubescent towards the extremities. *Tendrils* undivided. *Leaves* reniform-orbicular in outline, 1-3 in. in diam., deeply 5-7-lobed, thin, flaccid; lobes sinuate-dentate or lobulate, mucronate, narrowed to the base, glabrous or slightly pubescent; *petiole* 1-3 in. *Flowers* monœcious, yellow, about 1 in. across. *Male peduncle* slender, with a reniform or orbicular bract at or below the middle. *Calyx-lobes* ovate, acute. *Fem. peduncle* 2-4 in., bracteate near the base. *Ovary* fusiform, muricate. *Fruit* 1-5 in. long, orange-yellow, ovoid, tapering to both ends, longitudinally ribbed with rows of triangular tubercles. *Seeds* immersed in bright red pulp, compressed, sometimes almost 3-toothed, margins corrugated, faces sculptured.

Cultivated throughout India; also in Malaya, China, Trop. Africa and in America. Its native country is not known for certain. There are two

distinct forms grown within the area. The rainy-season kind, known as *kareli*, bears a smaller fruit and is more esteemed than that of the hot-weather crop. The fruit and other parts of the plant are used medicinally.

2. **M. Balsamina,** *Linn.; W. & A. Prod. 348; Royle Ill. 218; Watt E. D.; Cogn. in DC. Mon. Phan. iii, 439.*

Stem slender, much branched, glabrous or nearly so. *Leaves* 1½-3 in. in diam., orbicular in outline, palmately 3-5-lobed to the middle, punctulate on both surfaces; lobes acutely lobulate, mucronate; *petiole* ½-1½ in., hairy towards the base. *Flowers* monœcious. *Male peduncle* 1-3 in., hairy towards the apex; *bract* attached near the top, orbicular, cordate, denticulate, variegated. *Calyx-lobes* linear lanceolate, acute or acuminate. *Petals* ¼-½ in. long, yellowish, dark-brown at the base. *Fem. peduncle* less than ½ in., ebracteate. *Fruit* 1-3 in., ovoid, rostrate, orange-red, usually quite smooth. *Seeds* ½ in., compressed, nearly smooth.

Dehra Dun (Royle). DISTRIB. Punjab Plain and Sind, extending to Australia, and from Trop. Africa to the Cape. Introduced in America. The fruit is eaten as a vegetable, and when young it is used as a pickle.

3. **M. dioica,** *Roxb. ex Willd. Sp. Pl. iv, 605; Fl. Ind. iii, 709; W. & A. Prod. 348; Dene in Jacquem. Voy. Bot. t. 71; Royle Ill. 219; D. & G. Bomb. Fl. 102; F. B. I. ii, 617; Cogn. in DC. Mon. Phan. iii, 441.* M. Balsamina, *Wall.; W. & A. Prod. 349 (not of Linn.).*

Perennial, with a tuberous root. *Stems* slender, branching. *Leaves* 2-4 in. long and broad, cordate, ovate, acute, entire denticulate or more or less 3-lobed, glabrous, often punctate beneath; *petiole* 1-2 in., without glands. *Flowers* large, dicœcious, yellow. *Male peduncle* 2-6 in., with a glabrous or hairy cowl-like bract embracing the expanded flower. *Calyx-lobes* linear-lanceolate, acute. *Petals* 1 in. long. The 2-anthered filaments 2-fid half-way down. *Fem. peduncle* as long as that of the male, *bract* small, below the middle. *Fruit* 1-3 in., ovoid, shortly beaked, densely covered with soft spines. *Seeds* many, compressed, corrugated on margin, nearly smooth on the faces.

Common within the area. DISTRIB. Throughout India to Ceylon, ascending to 5,000 ft. on the Himalaya. In flower during the rainy season. The young fruit is eaten in curries, and the tuberous roots are also eaten.

4. **M. cochinchinensis,** *Spreng; F. B. I. ii, 618; Watt E. D.; Cogn. in DC. Mon. Phan. iii, 444.* M. mixta, *Roxb.; Fl. Ind. iii, 709; W. & A. Prod. 349.*

An extensively climbing perennial with a tuberous root. *Leaves* 4-5 in. in diam., suborbicular in outline, cordate, ovate, usually 3-lobed, glabrous or nearly so, entire or undulate-dentate, firm, punctate beneath; *petiole* glandular. *Flowers* dicœcious, large, whitish. *Male peduncle* 2-6 in., usually shorter than the leaves; *bract* embracing the expanded flower, often hairy. *Calyx-teeth* large, oblong-lanceolate, acute, coriaceous, dark-green. *Petals* 1-2 in., white tinged with yellow, 3 with black spots, 2 with yellow glands. The 2-anthered filaments not

2-fid. *Fem. peduncle* 1-2 in.; *bracts* small, near the middle. *Fruit* 4-5 in., ovate, pointed, bright-red, fleshy, not ribbed, aculeate with conical points. *Seeds* many, compressed, black, corrugate on margin, sculptured on the faces.

Bundelkhand (Mrs. Bell). DISTRIB. Bengal, Southern India, Burma; also in Malaya, China and in the Philippines.

7. **CUCUMIS.** Linn.; Fl. Brit. Ind. ii, 619.

Climbing herbs, hispid or scabrous; *tendrils* simple. *Leaves* petioled, palmately 3-7-lobed or 5-angled or entire, dentate or serrate. *Flowers* yellow, monœcious, solitary or clustered in the axils, all shortly pedunculed. MALE: *Calyx-tube* top-shaped or campanulate, lobes 5. *Stamens* 3; *anthers* free, one 1-celled, two 2-celled, cells conduplicate much flexuose, connective produced in a crest. FEMALE: *Calyx* and *corolla* as in the male. *Ovary* ovoid; *style* short, with 3 obtuse stigmas; *ovules* very many, horizontal; *placentas* 3. *Fruit* fleshy, indehiscent, large or small, spherical or elongate, smooth or tuberculate. *Seeds* very many, oblong, compressed, mostly smooth.—Species 26, of which about half are African, a few in Trop. Asia, Australia, and America, and several widely cultivated of doubtful origin.

Fruit glabrous or pubescent.

Annual, leaves 5-angled or-lobed, male flowers in clusters .	1. *C. Melo.*
Perennial, leaves deeply lobed, male flowers usually solitary .	2. *C. trigonus.*

Fruit spinous or tubercled.

Perennial, fruit green striped with white, covered with soft spines	3. *C. prophetarum.*
Annual, fruit sparingly tubercled	4. *C. sativus.*

1. **C. Melo**, *Linn.; Roxb. Fl. Ind. iii, 720; W. & A. Prod. 341; F. B. I. ii, 620; Cogn. in DC. Mon. Phan. iii, 482; DC. L'Orig. Pl. Cult. 205; Field & Gard. Crops part ii, 51, t. 50; Watt E.D.*—Vern. *Kharbuza* (The Melon).

An annual. *Stems* creeping, angular, scabrous. *Leaves* about 3 in. in diam., orbicular-reniform in outline, 5-angled or-lobed, scabrous on both surfaces and also often with soft hairs; lobes not deep nor acute; *petiole* 2 in. *Petals* ½ in. *Fem. peduncle* sometimes 2 in. *Fruit* spherical ovoid elongate or contorted, glabrous or somewhat hairy, not spinous nor tuberculate.

Extensively cultivated within the area and throughout India for the sake of its fruit, and chiefly on the sandy beds or margins of rivers. According

to DeCandolle the melon is truly wild in India, Baluchistan and in Trop. Africa. Cogniaux in his monograph (l. c.) divides the very numerous varieties into the following 2 groups which represent the wild and the cultivated kinds respectively:—(*a*) AGRESTIS, *Naud.* Syn. C. pubescens, *Willd.; W. & A. Prod. 342; Royle Ill. 220, t. 47, f. 1; D. & G. Bomb. Fl. 103.* C. maculatus, *Willd.; W. & A. l. c.* C. maderaspatanus, *Roxb.; Fl. Ind. iii, 723 (not of Linn.).*—(*b*) CULTA, *Kurz.* Syn. C. flexuosus, *Linn.; W. & A. Prod. 342.* C. aromaticus, *Royle Ill. 220.* C. utilissimus, *Roxb; Fl. Ind. iii, 721; W. & A. l. c.* C. Momordica, *Roxb. l. c. 720; W. & A. Prod. 341.*

C. pubescens, *Willd.* (Syn. C. maderaspatanus, *Roxb., not of Linn.*) has reniform leaves, which are hardly lobed, and are often only 3-angled; the fruit is oval and terete, not at all 3-sided, downy when young; when ripe spotted, and about the size of a partridge's egg. Dr. Watt remarks that in some respects the fruit approaches more closely to the melon proper than do the fruits of any of the other wild species met with in India. Roxburgh mentions that the fruit is eaten and much esteemed by natives, but that the plant is not cultivated by them. It is very probable that Royle's *C. aromaticus*, mentioned by Cogniaux in his group of cultivated forms of *C. Melo*, is a semi-cultivated condition of *C. pubescens*. It is met with in the Saharanpur district; and the fruit, which becomes aromatic when ripening, is much appreciated by the natives.

C. utilissimus and C. Momordica mentioned in the group of cultivated forms require to be specially noticed here, as they are cultivated rather extensively within the area of the Upper Gangetic Plain. When in fruit they differ from the type not only in appearance, but also by the very different uses to which they are put; and were it not for the conclusive deductions based on the results of Naudin's cultural experiments, they might very reasonably have been regarded as distinct species. For the sake of convenience they are here described as varieties.

VAR. 1. utilissimus, *Field & Gard. Crops part ii, 55, t.t. LIII, LIV; Watt E.D.* C. utilissimus, *Roxb. Fl. Ind. iii, 721.*—Vern. *Kakri.*—The fruit varies in shape from shortly oval or cylindrical to elongate, often reaching a length of 3 feet. It varies in colour from dark-green to nearly white, usually changing to a bright orange colour when ripe. The seeds are smaller than those of the melon. *Kakri* is an important article of food with the poorer classes during the hot-weather months. Roxburgh regarded this plant as the most useful species of *Cucumis* he knew. When little more than half-grown the oblong downy fruits are pickled; when ripe they have much the flavour of the melon, and will keep good for several months if carefully gathered and hung up. They are also in this stage eaten raw, and much used in curries by the natives. The seeds contain much farinaceous matter blended with a large portion of mild oil. The natives dry and grind them into a meal, which they employ as an article of diet, and they use the oil in their food, as well as for burning. (Roxb. l. c.)

VAR. 2. Momordica, *Field & Gard. Crops part ii, 50, t. 49; Watt E.D.* C. Momordica, *Roxb. l.c. 720.*—Vern. *Tuti, kachra* (unripe), *phunt*

(ripe).—The fruit is cylindrical and quite smooth, and when ripe bursts spontaneously, its colour at that time being yellow often mottled with dark-green. It varies in size from 1-2 feet long, and from 3-6 in in diam., and weighs from 4-8 lbs. The seeds are smaller than those of the melon. The estimated area in the North-West Prov. and Oudh returned as under *phunt* during the rainy season of 1881 was about 600 acres. The young fruit is cooked as a vegetable, or used as a substitute for the common cucumber; when ripe it is regarded as scarcely inferior to the melon. There are 2 distinct forms, one of which is grown during the hot season, and the other is a rainy-season crop.

2. **C. trigonus**, *Roxb. Hort. Beng. 70; Fl. Ind. iii, 722; W. & A. Prod. 342; D. & G. Bomb. Fl. 103; F. B. I. ii, 619 (in part); Cogn. in DC. Mon. Phan. iii, 495; Watt E. D.* C. turbinatus, *Roxb. Fl. Ind. iii, 723; W. & A. Prod. l. c.* C. pseudo-colocynthis, *Royle Ill. 220, t. 47, f. 2.*—Vern. *Indrayan, bislumbha.*

A scabrous perennial herb. *Tendrils* short. *Leaves* 1-2 in. in diam., cordate, suborbicular, usually deeply palmately 5-7 lobed, scabrid; lobes rounded or ovate-oblong, obtuse, toothed or lobulate; *petioles* ¼-⅜ in. *Male flowers* generally solitary, shortly peduncled. *Ovary* hairy, sometimes densely woolly or silky. *Fruit* about 1½ in. long, obovoid, terete or obscurely trigonous, ultimately glabrous, the surface green with vertical streaks of yellow.

Abundant within the area. DISTRIB. Throughout the greater part of India; also in Afghanistan and Persia. Typical *C. trigonus*, according to Roxburgh, resembles most nearly his *C. utilissimus* (see under *C. Melo*), but the leaves are more deeply lobed and more scabrous, the flowers are small, scarcely ½ in. in diam.; the fruit is 3-gonous and is not eaten. Roxburgh's *turbinatus* is a smaller plant with bristle-pointed leaves, much larger flowers, and the fruit is turbinate, 3-sided, and it is eaten. *C. pseudo-colocynthis* has slender very scabrous stems, the leaves are scabrous on both sides and covered with gland-like hair-bearing tubercles. Male and female flowers solitary and long-peduncled. Fruit oblong, smooth, and marked with 8 broad vertical stripes, flesh very bitter. The fruit is collected in many places and sold in the bazars as a drug, and very probably as an adulterant for the true *colocynth.*

3. **C. prophetarum**, *Linn.; W. & A. Prod. 342; F. B. I. ii, 619; Cogn. in DC. Mon. Phan. iii, 495.*

A perennial with scabrid whitish stems. *Tendrils* short. *Leaves* 1-1½ in. in diam., palmately 3-5-lobed, reniform or subtriangular in outline, rigid, scabrid, canescent; lobes acute or subobtuse, nerves prominent and reticulate beneath; *petiole* ½-1 in. *Male flowers* solitary or clustered in the axils. *Petals* ¼ in., villous. *Fem. peduncle* less than ½ in., stout. *Ovary* slightly muricate. *Fruit* about 1 in. long, subglobose or ellipsoid, puberulous and more or less softly aculeate, green with pale stripes.

Merwára (Duthie). DISTRIB. Sind, extending to Baluchistan, Persia, Arabia, Abyssinia and Egypt.

4. C. sativus, *Linn.; Roxb. Fl. Ind. iii, 720; W. & A. Prod. 342; F. B. I. ii, 620; Cogn. in DC. Mon. Phan. iii, 498; DC. L'Orig. Pl. Cult. 210; Field & Gard. Crops part ii, 53, t.t. LI & LII; Watt E.D.* C. Hardwickii, *Royle Ill. 220, t. 47, f. 3.*—Vern. *Khira.* (The Cucumber.)

An annual. *Stem* creeping, angled, scabrous. *Leaves* 3-5 in. in diam., angular or slightly 3-5 lobed, hispid on both surfaces and also softly hairy; lobes triangular, acute or acuminate, dentate; *petiole* 2-3 in. *Petals* ½ in. Young *ovary* muricate with rigid prickles. *Fruit* usually elongate, cylindrical or obscurely trigonous, glabrous or tuberculate, yellowish-green.

Cultivated in all parts of India, and in warm and temperate countries throughout the world. Its original home has been traced to N. India, where it has probably been under cultivation for at least 3,000 years. The variety of names by which it has been known in different parts of Europe indicates a very early introduction to that continent. The form *C. Hardwickii*, now regarded as a synonym of *C. sativus*, has all the essential characters of the cultivated plant, with the exception of the fruit, which being very bitter is not used as a vegetable, but as a medicine, and often as a substitute for *colocynth*. It is the *air-álu* of Kumaon, and the *pahari indrayan* of the submontane districts. There are 2 distinct forms of the Indian cultivated cucumber, one with a creeping stem and an egg-shaped fruit which ripens during the hot season; the other, ripening during the rainy season, has an elongated fruit more like that of the ordinary English cucumber. Both of these forms are figured in part ii of *Field and Garden Crops*.

8. CITRULLUS, Neck.; Fl. Brit. ii, 620.

Climbing or creeping herbs, hispid or scabrous; *tendrils* 2-3-fid. *Leaves* petioled, palmately 3-7-lobed, usually deeply into narrow sinuate-pinnatifid segments. *Flowers* monœcious, all solitary, rather large. MALE: *Calyx-tube* campanulate, lobes 5. *Stamens* 3, short; *anthers* scarcely cohering, one 1-celled, two 2-celled; cells conduplicate, connective not produced. FEM.: *Calyx* and *corolla* as in male. *Ovary* ovoid, *style* short; *stigmas* 3, reniform; *ovules* many, horizontal; *placentas* 3. *Fruit* globose or ellipsoid, smooth, fleshy, indehiscent. *Seeds* many, oblong, compressed, smooth.—Besides the Water-melon and Colocynth described below 2 other species are found in S. Africa.

Perennial, fruit globose not exceeding 3 in., intensely bitter . . . . . *1. C. Colocynthis.*

Annual, fruit subglobose or ellipsoid, up to 10 in. in diam., usually sweet . . . . . *2. C. vulgaris.*

1. C. Colocynthis, *Schrad.; D. & G. Bomb. Fl. 101; F. B. I. ii, 620; Field & Gard. Crops part ii, 57, t. lvii; Cogn. in DC. Mon. Phan. iii, 510; Watt E. D.* Cucumis Colocynthis, *Linn.; Roxb. Fl. Ind. iii, 719; W. & A. Prod. 342.*—Vern. *Indrayan, mákál.* (Colocynth.)

A perennial herb, with trailing angular scabrous stems. *Tendrils* 2-fid. *Leaves* 2½ by scarcely 2 in. in the typical wild very scabrous form, larger in the cultivated forms which approach *C. vulgaris*, ovate or narrowly triangular, cordate or reniform at the base, deeply divided, the mid-lobe twice pinnatifid and much longer; *petiole* 1 in. *Petals* ¼ in., obovate, light yellow. *Fruit* up to 3 in. in diam., globose, variegated with dark-green and white; pulp dry, spongy, intensely bitter. *Seeds* not margined.

In sandy tracts within the area. DISTRIB. In many parts of India both wild and cultivated, and in Ceylon. It is indigenous also in Arabia, W. Asia, N. and Trop. Africa and in the Mediterranean region. The bitter seed-bearing portion of the fruit is a well known purgative, the oil obtained from the seeds and the root is also used medicinally.

2. **C. vulgaris**, *Schrad.; F. B. I. ii, 621; Cogn. in DC. Mon. Phan. iii, 503; D.C. L'Orig. pl. Cult. 209; Field & Gard. Crops part ii, t. t. LV & LVI; Watt E. D.* Cucurbita Citrullus, *Linn.; Roxb. Fl. Ind. iii, 719; W. & A. Prod 351.*—Vern. *Tarbuza.* (The Water-melon.)

An extensively climbing annual with thick angular branching stems; young shoots villous, woolly at their tips. *Tendrils* bifid, stout, pubescent. *Leaves* 3-8 in. long, deeply divided, or but moderately lobed, glabrous or somewhat hairy, hardly scabrous; *petiole* a little shorter than the limb, villous. *Calyx-lobes* narrowly lanceolate, equalling the tube. *Corolla* yellow within, greenish outside and villous; lobes ovate-oblong, obtuse, prominently 5-nerved. *Fruit* up to 10 in. in diam., subglobose or ellipsoid, smooth, greenish or clouded, often with a glaucous waxy coating; flesh juicy, red or yellowish-white. *Seeds* usually margined.

Largely cultivated within the area, and throughout India and in all warm countries of the world. It is indigenous in Trop. and S. Africa. The fruit of the wild plant may be bitter or sweet without any observable difference externally. In Upper India the fruit ripens at the beginning of the hot season.

VAR. fistulosus, *Field & Gard. Crops part ii, 46, t. XLVII; Watt E. D.* C. fistulosus, *Stocks.*—Vern. *Tendus, tendu, tensi. Stems and petioles* hollow. *Tendrils* 3-4 rarely 5-fid. *Leaves* much less divided. *Fruit* about the size of a small turnip, depressed at each end, hispid when young, afterwards glabrous. Its cultivation is confined to the W. districts of the area, and it is largely grown in the Punjab and in Sind where it is called *dilpasand*. The fruit, which ripens during the rainy season, is eaten as a vegetable, and is often pickled when young. It is highly esteemed both by Hindus and Mussalmans.

9. COCCINIA, W. & A.

(under Cephalandra in Fl. Brit. Ind. ii, 621.)

Climbing or prostrate herbs, glabrous or scabrous. *Tendrils* simple, rarely 2-fid. *Leaves* petioled, 5-angular or 5-lobed, toothed. *Flowers*

diœcious moderately large, solitary and white in the Indian species, without bracts. MALE: *Calyx-tube* campanulate, short, limb 5-lobed. *Corolla* campanulate, 5-lobed about ½ way down. *Stamens* 3; *anthers* exsert, connate, one 1-celled, two 2-celled, cells conduplicate. FEM.: *Calyx* and *corolla* as in the male. *Ovary* oblong; *style* long, with 3 bifid stigmas; *ovules* many, horizontal; *placentas* 3, vertical. *Fruit* fleshy, indehiscent, cylindric, smooth. *Seeds* many, ovoid, compressed, margined.—Species about 19, in Trop. Asia and Africa.

C. indica, *W. & A. Prod. 347; Royle Ill. 218; Dcne in Jacquem. Voy. Bot. t. 72; D & G. Bomb. Fl. 103.* C. cordifolia, *Cogn. in DC. Mon. Phan. iii, 529.* Cephalandra indica, *Naud.; F. B. I. ii, 621; Watt E. D.* Momordica monadelpha, *Roxb. Fl. Ind. iii, 708.*—Vern. *Kanduri.*

A perennial with tuberous roots. *Leaves* 2-4 in. in diam., 5-angled or -lobed, cordate, shining, scabrid; *petiole* 1 in. *Flowers* white. *Male peduncle* 1 in., jointed below the flowers. *Calyx-lobes* linear-oblong, reflexed. *Corolla* nearly 1 in.; lobes long, triangular. *Fem. peduncle* about ½ in. *Ovary* smooth. *Fruit* ovoid or oblong, bright-scarlet. *Seeds* embedded in red pulp.

Common within the area. DISTRIB. Throughout India and in Ceylon; also in the Malay Penins., often cultivated. The young green fruit is used in curries, and when ripe it is eaten raw. The plant is also used medicinally. A vertical section of the fruit resembles that of a small pomegranate.

10. CUCURBITA, Linn.; Fl. Brit. Ind. ii, 621.

Large climbing herbs, annual or perennial, hispid or hairy. *Tendrils* 2-4-fid. *Leaves* petioled, cordate, ovate, 5-angular or lobed. *Flowers* monœcious, all solitary, yellow, large. MALE: *Calyx-tube* campanulate; lobes 5, linear or foliaceous. *Corolla* campanulate, 5-lobed hardly half-way down. *Stamens* 3, inserted low in the calyx-tube; *anthers* connate, one 1-celled, two 2-celled, cells conduplicate. FEM.: *Calyx* and *corolla* as in male. *Ovary* oblong, *style* short, *stigmas* 3, bifid; *ovules* very many, horizontal, *placentas* 3. *Fruit* fleshy, indehiscent, often large. *Seeds* ovoid or oblong, compressed, margined or not.—Species 10, four of which are in cultivation.

Leaves rigid; cal.-tube campanulate; segments subulate, fleshy.
- Lobes of leaf rounded, sinuses between lobes hardly any, peduncle terete . . . . . *1. C. maxima.*
- Lobes of leaf acute, sinuses between the lobes usually deep, peduncles obtusely 5-gonal . *2. C. Pepo.*

Leaves soft, cal.-tube very short or none, segments foliaceous at the tips . . . . . *3. C. moschata.*

1. **C. maxima**, *Duchesne; F. B. I. ii, 622; Cogn. in DC. Mon. Phan. iii, 544; DC. L'Orig. Pl. Cult. 199; Field & Gard. Crops 58; Watt E. D.* (The great Pumpkin or Spanish Gourd).—Although reported to be under cultivation within the area of this flora, all the specimens under this name which I have examined were undoubtedly C. moschata. Wights' t. 507, named *C. maxima Duch.*, is certainly *C. moschata*, and Atkinson repeats the error in his "Notes on the Economic Products of the N.-W. Provinces." It is said to have been found wild on the banks of the Niger in Guinea, but the evidence obtained from historical research favours the opinion that it originated in Asia, and subsequently became the source of the European pumpkins cultivated during the Middle Ages. The principal varieties of *C. maxima* are the great yellow gourd, the Spanish gourd and the Turban gourd.

2 **C. Pepo**, *Linn.; Roxb. Fl. Ind. iii, 718; W. & A. Prod. 351; F. B. I. ii, 622; Cogn. in DC. Mon. Phan. iii, 545; DC. L'Orig. Pl. Cult. 202; Field & Gard. Crops ii, 59; Watt E. D.*—This, the true Pumpkin, is grown in many private gardens within the area, and to some extent by natives, but not as a field-crop. It has been confused by many Indian writers with *Benincasa cerifera* as well as with *Lagenaria vulgaris*. It is now considered to be a true native of America, and the source of the various American gourds and pumpkins, some of which were in existence prior to the discovery of that country. A form of this species (C. ovifera) is the vegetable marrow.

3. **C. moschata**, *Duchesne; F. B. I. ii, 622; Cogn. in DC. Mon. Phan. iii, 546; DC. L'Orig. Pl. Cult. 204; Field & Gard. Crops ii, 58, t. t. LVIII–LXI; Watt E. D.* C. Melopepo, *Lour (not of Linn.) Roxb. Fl. Ind. iii, 719.* C. maxima, *Wall (not of Duch.); W. & A. Prod. 351; Wight Ic. 507.*—Vern. *Sitaphal, mitha kaddu* (the Musk or Melon pumpkin). The original home of this species is not known for certain. It is now widely cultivated in both hemispheres, and appears to require a more tropical climate than that which suits *C. maxima* & *C. Pepo*. It is grown to some extent within the area of this flora as a field-crop.

11. MELOTHRIA, Linn.; Fl. Brit. Ind., 625.

Annual or perennial climbing or prostrate herbs. *Leaves* entire or more or less lobed, usually membranous. *Tendrils* usually simple. *Flowers* small, monœcious, rarely dicœcious, yellow or white. *Males* in racemes corymbs or clusters, rarely solitary. *Calyx* campanulate, shortly 5-toothed. *Corolla* deeply 5-partite, lobes entire. *Stamens* 3, inserted in the tube of calyx; *anthers* usually free, one 1-celled, the others 2-celled, or all 2-celled; cells straight, rarely curved, connective sometimes prolonged. *Female flowers* solitary fascicled or corymbose. *Calyx* and *corolla* as in male. *Style* short, with an annular disk at the base; *stigmas* 3, rarely 2, or stigma 3-lobed. *Ovules* many, horizontal, on 3 or 2 vertical placentas. *Fruit* a berry,

small round ovoid or fusiform. *Seeds* usually many, ovoid or oblong, compressed rarely turgid, usually margined, smooth rarely rough.—Species about 60, in the tropical regions of both hemispheres.

Male flowers in corymbs, connective of stamens not prolonged, seeds smooth.
- Flowers monœcious; seeds small, much compressed . . . . . 1. *M. perpusilla.*
- Flowers diœcious; seeds large, turgid . 2. *M. heterophylla.*

Male flowers in clusters, connective of stamens produced, seeds rough . . . . . 3. *M. maderaspatana.*

1. **M. perpusilla**, *Cogn. in DC. Mon. Phan. iii, 607.* Bryonia Hookeriana, *W. & A. Prod. 345.* B. cissioides, *Wall.; Royle Ill. 218.* Zehneria Hookeriana, *Arn.: F. B. I. ii, 624.*

Stems very slender. *Leaves* 2-3½ in. long, ovate, cordate, entire or angled, rarely 3-5-lobed, acute mucronate or shortly acuminate, denticulate, scabrous above and usually glabrous beneath; *petiole* 1½-2 in. long. *Flowers* monœcious, pale-yellow, the males capitate or umbellate at the apex of the common peduncle. *Calyx-teeth* very short, recurved. *Filaments* villous, connective not produced. *Fem. flowers* solitary or sub-umbelled. *Fruit* globose ⅓ in. in diam., finely reticulate, glabrous. *Seeds* small, compressed, distinctly margined, smooth.

Dehra Dun (Royle), Babraich dist. N. Oudh (Duthie's collector). DISTRIB. Nepal, E. Bengal, E. Himalaya up to 5,000 ft., S. India to Ceylon, and in Java.

2. **M. heterophylla**, *Cogn. in DC. Mon. Phan. iii, 618.* Bryonia umbellata, *Klein; W. & A. Prod. 345; D. & G. Bomb. Fl. 101.* Momordica umbellata, *Roxb. Fl. Ind. iii, 710.* ? B. filiformis, *Roxb. l.c. 727.* Zehneria umbellata, *Thwaites; F. B. I. ii, 625 (in part); Watt E. D.*

A perennial herb with tuberous roots. *Tendrils* very long. *Leaves* very variable, ovate oblong suborbicular or narrowly lanceolate in outline, entire or variously lobed, and sometimes nearly to the base, often cordate or hastate at the base, acute or acuminate, denticulate, rough above, usually smooth beneath. *Male flowers* corymbose. *Calyx* glabrous; teeth subulate. *Corolla* yellowish-white. *Anthers* densely ciliate. *Female flowers* solitary, on short peduncles. *Fruit* ½-1½ in., oblong, cylindric, red when ripe. *Seeds* many, subglobose, not margined, smooth.

Common within the area, and throughout India to Ceylon; also in China, Cochinchina and in Java. The fruit is eaten raw by the natives, and the roots are boiled and eaten. The seeds and leaves are used medicinally. It is an extremely variable species, of which Cogniaux in his Monograph (l.c.) describes 12 distinct forms founded on the shapes of the leaves. One of these is the var. *nepalensis* of F. B. I. (l.c.), which is a common plant on the W. Himalaya between 4,000 and 7,000 ft. and may be distinguished by its deeply palmate leaves and by the ovary which is densely velvety.

3. **M. maderaspatana**, *Cogn. in DC. Mon. Phan. iii, 623.* Bryonia scabrella, *Linn. f.; Roxb. Fl. Ind. iii, 724; W. & A. Prod. 345.* Mukia scabrella, *Arn.; D. & G. Bomb. Fl. 100; F. B. I. ii, 623; Watt E.D.*— Vern. *Gwála-kakri.*

A scandent or prostrate annual, with slender angular hispid or scabrous stems. *Leaves* 1-3 in., ovate or subdeltoid, entire angled or 3-5-lobed, acute or subacuminate, dentate or coarsely serrate, very rough. *Flowers* monœcious, yellow. *Male flowers* in clusters. *Calyx-tube* villous; teeth subulate. *Corolla* hairy outside. Connective of stamens produced. *Fem. flowers* solitary or subfascicled. *Fruit* small, globose, very shortly stalked, bright red when ripe. *Seeds* turgid.

Common within the area and throughout India to Ceylon; also in the Malay Archipel., Formosa and in Australia. The plant is used medicinally.

12. BLASTANIA, Kotschy & Peyr.

(under Ctenolepis in Fl. Brit. Ind. ii, 629.)

Climbing or prostrate scabrous herbs, turning black in drying. *Tendrils* simple. *Leaves* 3-5-lobed, cordate, orbicular; *stipuliform bracts* at the axils of the leaves large, round or elliptic, ciliate or dentate. *Flowers* minute, monœcious. *Males* in small racemes on inconspicuous axile peduncles. *Calyx-tube* short, campanulate; lobes very small, subulate. *Corolla* 5 partite. *Stamens* 3, *filaments* very short; *anthers* free, one 1-celled, two 2-celled; cells straight, connective not produced, rudiment of ovary 0. *Female flowers* solitary, short-peduncled, in the same axils with the males. *Calyx* and *corolla* as in male. *Ovary* ovoid, *disk* 0, *stigmas* 2 or 3; *ovules* usually 2, horizontal; *placentas* parietal. *Fruit* small, globose or obliquely subquadrate, indehiscent. *Seeds* ovoid, compressed, margined, somewhat boat-shaped.—Species 2, one in Trop. & S. Africa extending to Western India and the following.

B. Garcini, *Cogn. in DC. Mon. Phan. iii, 629.* Bryonia Garcini, *Willd.; Roxb. Fl. Ind. iii, 727; W. & A. Prod. 341.* Zehneria Garcini, *Stocks; D. & G. Bomb. Fl. 99.* Ctenolepis Garcini, *C. B. Clarke in F. B. I. ii, 629; Watt E. D.*

Stem more or less scabrous and punctate, not hairy. *Leaves* 1-1½ in. in diam., deeply 5-lobed, membranous, loosely villous on both sides, at length white and scabrous, lobes about equal, often sinuate or lobulate. *Male peduncle* very short; *stipuliform bracts* ¼ in. or more, ovate or round, ciliate. *Fruit* ½ by ½ in., narrowly subreniform, red when ripe.

Etawah dist. (Duthie), Bundelkhand (Edgeworth and Duthie). DISTRIB. Deccan plateau, Ceylon. The plant is said to be used medicinally.

13. CORALLOCARPUS, Welw.; Fl. Brit. Ind. ii, 627.

Climbing or prostrate herbs, scabrid or subtomentose; *tendrils* simple. *Leaves* petioled, roundish-cordate, somewhat thick, entire lobed or palmate. *Flowers* very small, monœcious; *males* in a small corymb at the apex of a long peduncle; *females* short-pedicelled or subsessile, solitary or clustered. MALE: *Calyx-tube* campanulate, lobes 5, short. *Corolla* 5-partite. *Stamens* 3, nearly sessile at the mouth of the calyx-tube; *anthers* free, all 2-celled or one 1-celled; cells straight, oblong, lateral on the thin connective which is not produced. *Ovary* rudimentary. FEMALE: Calyx and corolla as in the male. *Ovary* ovoid; *disk* 0, *stigmas* 3 or 2; *ovules* not very many, horizontal; *placentas* 3-2, vertical. *Berry* ovoid, circumscissed near the base, usually rostrate. *Seeds* ellipsoid or nearly globose, somewhat compressed, smooth or nearly so, little margined.—Species 15, chiefly in Trop. Asia and Africa, and one in Trop. America.

C. epigæus, *C. B. Clarke in F. B. I. ii, 628; Cogn. in DC. Mon. Phan. iii, 649; Watt E. D.* Bryonia epigæa, *Rottl.; W. & A. Prod. 346.* B. glabra, *Roxb.; Fl. Ind. iii, 725.* Æchmandra epigæa, *Arn.; D. & G. Bomb. Fl. 100.*

Root turnip-shaped. *Leaves* 2-in. in diam., broadly suborbicular, 3-5-angled or -lobed, punctate, or scabrid with minute hairs; lobes often lobulate, obtuse, margins sinuous; *petiole* 1 in. *Flowers* greenish-yellow. *Male-peduncle* 1½-2 in. *Fem.-peduncle* ½-¾ in. or more, stout. *Fruit* stalked, ⅝ in. including beak, ellipsoid or ovoid, suddenly narrowed into the beak, reddish when ripe. *Seeds* about 6, ellipsoid, turgid, smooth, margined.

Bundelkhand (Duthie). DISTRIB. Punjab (Aitchison), Sind and Gujarat (Dalzell), Deccan Penins., Ceylon. The root is used medicinally.

14. BRYONOPSIS, Arn.

(under Bryonia in Fl. Brit. Ind. ii, 622.)

Climbing annual herbs, more or less scaberulous. *Tendrils* 2-fid. *Leaves* deeply palmately 5-lobed. *Flowers* monœcious, not in racemes, small, greenish-yellow, males and females often clustered in the same axils. MALE: *Calyx-tube* widely campanulate; teeth short, narrow. *Corolla* 5-partite, lobes ovate. *Stamens* 3, free, inserted low down on tube; *anthers* ovate, one 1-celled, the others 2-celled, cells curved or somewhat sigmoid, connective not produced; rudiment of ovary 0. FEM.: *Calyx* and *corolla* as of male. *Staminodes* 3, small. *Ovary* globose or ovoid; *style* slender, 3-fid., without a basal disk; *ovules* horizontal; *placentas* 3. *Fruit* a spherical or ovoid-conical

berry. *Seeds* few, with a thick margin, often rough on their convex faces.—Species 2, one in Trop. Asia, Africa and Australia, the other in Norfolk Island.

B. laciniosa, *Naud.; Cogn. in DC. Mon. Phan. iii, 477.* Bryonia laciniosa, *Linn.; Roxb. Fl. Ind. iii, 728; W & A. Prod. 345; D. & G. Bomb. Fl. 101; F. B. I. ii, 622; Watt E. D.*—Vern. *Bilanja* (Bundelkhand).

Stems slender, angular, glabrous or nearly so. *Leaves* usually deeply palmately 5-lobed, often scabrous and punctate above; lobes 2-3 in., with a broad or narrow sinus; *petiole* often as long as the blade, sometimes muricate near the apex. *Male-pedicels* less than 1 in., those of the female still shorter. *Calyx-tube* glabrous, teeth subulate. *Berries* sessile, often 2 or 3 together, ¾ in. across, globose, green with white longitudinal stripes. *Seeds* ¼ in., ovoid, with a thickened corrugated margin, the faces often muricated.

Common within the area. DISTRIB. Throughout India from the Himalaya to Ceylon; also in Java, the Philippines and in Australia. The leaves are sometimes boiled and eaten as a vegetable. The plant when in fruit is collected for medicinal use.

15. THLADIANTHA, Bunge.; Fl. Brit. Ind. ii, 630.

Climbing perennial herbs with tuberous roots. *Tendrils* simple, rarely 2-fid. *Leaves* petioled, entire or rarely 3-partite, deeply cordate. *Flowers* dicœcious, yellow. *Male peduncles* in pairs, one 1-flowered without bracts and caducous, the other racemed and the flowers with or without bracts. *Fem. peduncle* elongated, 1-flowered, ebracteate. MALE: *Calyx-tube* shortly campanulate, closed below by a horizontal scale; lobes entire, linear or narrowly lanceolate. *Corolla* campanulate, 5-partite; lobes entire, oblong, reflexed. *Stamens* 5, inserted near the mouth of calyx-tube; *anthers* 1-celled, narrow-oblong, straight. FEM.: *Calyx* and *corolla* as in male, but without the basal scale in the calyx. *Staminodes* 5, linear. *Ovary* oblong; *style* deeply 3-fid., with 3 reniform stigmas; *ovules* many, horizontal. *Fruit* an oblong indehiscent many-seeded berry, green or red, with vertical ribs. *Seeds* many, small, compressed, smooth, not margined.—Species 4, in S. E. Asia and Java

T. calcarata, *C. B. Clarke in Journ. Linn. Soc. xv, 126; Cogn. in DC Mon. Phan. iii, 423.* T. dubia, *Hook. f. in Bot. Mag. 5469; F. B. I. ii. 631 not of Bunge).*

A large climber. *Leaves* 4 in. long, undivided, cordate, ovate, acute, pedately veined from the base, denticulate, usually villous beneath, or at length scabrous; *petiole* 1½ in. or more, villous. *Male flowers* many approximate at the summit of a long peduncle; *bracts* broadly ovate incised. *Calyx-teeth* very narrow, recurved. *Petals* ¾ in. long, golden yellow, slightly hairy. *Female peduncle* 2-3 in., slender, villous

Young *ovary* densely woolly. *Fruit* 1½ in. long, oblong-subcylindric, nearly glabrous, green and often blotched with black. *Seeds* not exceeding ¼ in., rugulose.

Bundelkhand (Mrs. Bell). DISTRIB. E. Bengal, Nepal, and on the Sikkim Himalaya up to 8,000 ft.

16. ACTINOSTEMMA, Griff.; Fl. Brit. Ind. ii, 632.

Climbing weak herbs; *tendrils* simple and 2-fid. *Leaves* petioled, deeply cordate or hastate, elongate, much toothed, nearly glabrous. *Flowers* small monœcious, in lax axillary panicles, *pedicels* jointed about their middle; *panicles* frequently male with a few females near the base. MALE: *Calyx* rotate, 5-partite, with lanceolate-linear segments. *Corolla* 5-partite, segments lanceolate-caudate. *Stamens* 5, free; connective dilated, papillose on one side, with a narrow straight oblong anther-cell on the other. FEMALE: *Calyx* and *corolla* as in the male. *Ovary* subglobose, verrucose, 1-celled; *style* short, with 2 reniform stigmas; *ovules* 2-4, pendulous, subparietal. *Capsule* ovoid, conical, ½-superior, covered with rough points, circumsciss above the middle. *Seeds* 2-4, compressed, ovate corrugated and denticulate on the margin.—Species 4, inhabiting India, China and Japan.

A. tenerum. *Griff. Pl. Cantor. 24, t. 3; F. B. I. ii, 633 (in part); Cogn. in DC. Mon. Phan. iii, 919.*

Stems slender, slightly hairy, at length scabrous. *Tendrils* 2-fid. or the upper ones simple. *Leaves* 4 by 2½ in., narrowly triangular in outline, sagittately 3-lobed, acute or acuminate, serrate or denticulate, punctate and scabrid above; *petiole* often 2 in.; *male panicles* 3-6 in., hairy, *pedicels* very short, *bracts* subulate. *Fem. flowers* solitary or clustered. *Calyx-teeth* subulate, with glandular margins. *Fruit* ¾ by ½ in., ovate-elliptic, not 3-gonous, upper part muricated as well as the lower; *operculum* large, conical. *Seeds* about ½ in. long, slightly rugulose on the faces.

Rohilkhand in the Pilibhit dist., and in the Khari dist. of N. Oudh (Duthie's collector). DISTRIB. E. Bengal, Assam, Silhet; also in China.

Allied to the gourds are the Passion flowers, belonging to the natural order *Passifloraceæ*, the species of which are confined chiefly to S. America. Several kinds of *Passiflora* are cultivated in Indian gardens for the sake of their handsome flowers; and others, such as *P. edulis and P. quadrangularis*, are grown for their edible fruit. *P. fœtida*, L., from Brazil, has become naturalized in certain parts of the area, and often has all the appearance of an indigenous species.

The *Papaw* or *Papaya-tree* (Carica Papaya, L.), belonging to the natural order *Caricaceæ*, is much cultivated for its edible fruit in Indian gardens, and in all tropical countries. It is a large tree-like herbaceous plant, with a succulent trunk terminated by a tuft of large glabrous palmatifid leaves. *Flowers* usually dicœcious. *Male flowers* in long drooping panicles; *stamens* 10, inserted in the mouth of the corolla, alternately shorter. *Fem. flowers* in short clusters; *ovary* free; *ovules* many, attached in 2 rows to 5 periatal placentas. *Fruit* succulent, 1-celled, oblong, furrowed indehiscent. This plant is indigenous in C. America and the W. Indies. For a full account of its medicinal properties, and of the remarkable action of its milky juice in contact with nitrogenous substances, see Dr. Watt's Dictionary article.

LV.—BEGONIACEÆ.

SUCCULENT herbs or undershrubs; *stem* often reduced to a rhizome or tuber. *Leaves* alternate, more or less unequal-sided, entire toothed or lobed; *stipules* 2, free, often deciduous. *Peduncles* axillary, divided into dichotomous cymes, the branches and bracts at their divisions generally opposite. *Flowers* usually showy, monœcious. MALE: perianth (of *Begonia*, the only Indian genus) of 2 outer valvate opposite sepaloid segments, and 2-0 inner smaller segments; *stamens* many, free or 1-adelphous, *anthers* narrowly obovoid. FEMALE: *Perianth* (of *Begonia*) of 5-2 segments. *Ovary* (of *Begonia*) inferior, 2-3-4-celled; *placentas* vertical, axile (in bud), divided or simple; *styles* 2-4, free or combined at the base, *stigmas* branched or tortuous; *ovules* very many. *Fruit* usually capsular, often winged. *Seeds* very many, minute, globose or narrow cylindric, testa reticulated, albumen very scanty or none.—Species about 400, in all trop. moist countries except Australia.

BEGONIA, Linn.; Fl. Brit. Ind. ii, 635.

For characters see the Order.

B. amœna, *Wall. Cat. 3632; F. B. I. ii, 642.* B. tenella, *Don. Prod. 223; Royle Ill. 313.*

A glabrous succulent herb with a tuberous rhizome. *Stem* usually very short or 0, often producing runners from the base. *Leaves* 3 by 2 in., ovate or oblong, caudate-acuminate, equally cordate at the base, crenate-serrate; petiole 2-3 in.; *stipules* ovate. *Scape* 3-8 in., few-flowered, laxly 2-chotomous; *bracts* ovate-oblong, caducous. *Flowers* pink. MALE fl.: 2 outer lobes of perianth ovate, the 2 inner narrower. *Stamens* shortly 1-adelph. *Fem. fl.* with 3 perianth segments, 2 ovate and one smaller lateral one, all becoming enlarged and persistent.

Styles 3, nearly separate, divided near the top into 2 curved branches, persistent. *Capsule* ⅜ in.; wings nearly equal. *Seeds* slender, cylindric.

Dehra Dun (Duthie) and Siwalik range (Royle). DISTRIB. Punjab Himalaya to Sikkim, up to 7,000 ft. Very common on rocks, and flowering during the rains.

The *Pricly Pear* (Opuntia Dillenii, Haw.), belonging to the natural order *Cacteæ*, should be briefly mentioned here, as it has become completely naturalized within the area and in other parts of India. It is a native of S. America and was probably introduced into India by the Portuguese. Its chief value is derived from a dye (cochineal) produced by the puncture of a species of *coccus*, which must have been introduced into India along with the original plants. An interesting account of this dye and of the efforts made to secure superior kinds of the *coccus* insects will be found in the Dictionary of the Economic Products of India. See also Brand. For. Fl. 245. Its vernacular name is *Nagphana* (snake's hood). The plant has been much used for hedges, and in former years chiefly as a means of defence. It spreads rapidly, especially on waste barren land. The fruit as produced in India is very inferior to that obtained in Europe and America; it is much eaten, however, by the poorer classes of people during times of scarcity. The succulent stems and leaves, after removal of the spines, are said to form an excellent supplementary food for cattle.

LVI.—FICOIDEÆ.

HERBS. *Leaves* simple, often fleshy, usually opposite or whorled; *stipules* 0 or scarious *Flowers* usually in cymes or clusters rarely solitary, regular, hermaphrodite rarely polygamous. *Calyx* of 4-5 segments, united into a tube or nearly distinct, free from the ovary in the Indian genera, often persistent. *Petals* usually wanting or small. *Stamens* perigynous or hypogynous, few or many, *staminodes* sometimes present. *Ovary* usually free, 2-5-celled, syncarpous (except in *Gisekia*); *styles* as many as the carpels; *ovules* many in each carpel and axile, or solitary and basal. *Fruit* usually capsular, splitting dorsally or circumsciss, more rarely of separate cocci. *Seeds* many or 1 in each carpel, usually reniform, compressed; embryo curved or annular, surrounding the farinaceous albumen.—Species about 450, chiefly African.

This order as here presented is, as Dr. Trimen remarks in his Flora of Ceylon ii, 267, a somewhat ill-defined one. The arrangement of the genera in Engler and Prantl's Pflanzenf. Vol. III, part i, b, is in many respects a better one, in that it brings into closer relation the *Phytol-*

accaceæ (including *Gisekia*) with the *Caryophyllaceæ* and the *Ficoideæ* (including *Trianthema* and *Mollugo*).

Stamens inserted on the calyx-tube . .	1. TRIANTHEMA.
Stamens hypogynous.	
Stipules caducous, fruit a 3-5-celled capsule.	2. MOLLUGO.
Stipules 0, fruit of 5 separate indehiscent 1-seeded carpels	3. GISEKIA.

1. TRIANTHEMA, Linn.; Fl. Brit. Ind. ii, 660.

Diffuse prostrate branched herbs, glabrous or papillose. *Leaves* petioled, opposite, unequal, from linear to ovate or obovate, entire; *petioles* connected at the base by their dilated membranous margins, *stipules* 0. *Flowers* small, axillary, sessile or pedunculed, solitary or in cymes or clusters. *Calyx-tube* short or long, lobes 5, often cuspidate, coloured within. *Petals* 0. *Stamens* 5-10 or more, inserted near the top of the calyx-tube. *Ovary* free, 1-2-celled; *styles* 1 or 2, subulate; *ovules* 1 or many, basal. *Capsule* membranous or coriaceous, clavate, circumsciss, the upper portion often carrying away 1 or 2 seeds attached to or enclosed in it, the lower portion 2-many-seeded. *Seeds* reniform; embryo annular.—Species 12, in the tropical and subtropical regions of the world.

Style 1.	
Stamens about 15	1. *T. monogyna.*
Stamens 5	2. *T. crystallina.*
Styles 2.	
Stamens 5	3. *T. pentandra.*

1. T. monogyna, *Linn.; F. B. I. ii, 660; Watt E. D.* T. obcordata, *Roxb.; Fl. Ind. ii, 445; W. & A. Prod. 355; D. & G. Bomb. Fl. 14.*

A prostrate glabrous or slightly pubescent herb. *Leaves* ½-1½-in. long, obovate; *petiole* ⅛ in., dilated and membranous at the base. *Flowers* solitary. *Calyx-tube* scarious, thin, closely sheathed by the base of the petiole; lobes ovate, cuspidate. *Stamens* 10-20. *Ovary* truncate, style 1. *Capsule* ⅛ in., scarious below; beak exerted, coriaceous, submitriform, carrying away with it 3 of the 6-8 seeds. *Seeds* black, scarcely shining, marked with raised lines.

Common within the area. DISTRIB. Throughout India and in Ceylon; also in W. Asia, Africa and Trop. America. The root is used medicinally, and the leaves and stems are eaten as a vegetable.

2. T. crystallina, *Vahl.; Roxb.; Fl. Ind. ii, 444; W. & A. Prod. 355; D. & G. Bomb. Fl. 14; F. B. I. ii. 660; Watt E. D.*—Vern. *Pathar-phor* (Merwára).

A glabrous or minutely papillose herb, with prostrate filiform stems. *Leaves* ½-¾ in., narrowly oblanceolate or elliptic, *petiole* very short or 0.

Flowers solitary or in pairs in the axils. *Calyx-tube* herbaceous, with many ribs, not sheathed by the base of the petiole; lobes triangular, cuspidate *Stamens* 5. *Style* 1. *Capsule* $\frac{1}{12}$ in., 2-seeded; beak a circular corky flat disk, depressed in the centre and open below. *Seeds* discoid, dull black, marked with raised lines.

Common within the area. DISTRIB. Throughout India and in Ceylon, but not extending to Bengal; also in Africa.

3. T. pentandra, *Linn.; F. B. I. ii, 660; Watt E. D.* Papillose or nearly glabrous. *Leaves* 1-1½ in., oblong or elliptic; *petiole* ¼ in. *Flowers* in sessile clusters, *calyx-lobes* ovate, often scarious on the margins. *Stamens* 5. *Styles* 2. *Capsule* ⅛ in.; beak mitriform, separating into 2 lanceolar 1 seeded parts, coriaceous, closely adnate to the included seed; lower portion of capsule 2-seeded. *Seeds* black, dull, puberulous, obscurely ineate.

Rohilkhand, Etáwah and Agra districts and in Merwára. DISTRIB. Punjab and Sind; also in Africa. The plant is medicinal, and is also eaten as a potherb in times of scarcity.

2. MOLLUGO, Linn.; Fl. Brit. Ind. ii, 662.

Herbs, branched, often dichotomous. *Leaves* often falsely whorled, or alternate, or all radical, from linear to obovate, entire; *stipules* quickly disappearing. *Flowers* axillary, sessile or pedicelled, clustered or in cymes or racemes, small, greenish; *bracts* inconspicuous. *Sepals* 5, persistent. *Petals* 0. *Stamens* 5-3, rarely many; *staminodes* (? petals) 0 or small in the same species. *Ovary* free, globose or ellipsoid, 3-5-celled; *styles* 3-5 linear or very small; *ovules* many, axile. *Capsule* membranous, sheathed by the sepals, 3-5-celled, dehiscing dorsally. *Seeds* usually several in each cell, reniform, appendaged or not at the hilum, embryo annular.—Species about 18, in the tropical and subtropical regions of the world.

Flowers axillary, seeds appendaged at the hilum.
- Densely stellate-hairy . . . . . 1. *M. hirta.*
- Glabrous . . . . . 2. *M. oppositifolia.*

Flowers in terminal cymes, seeds not or very minutely appendaged.
- Leaves in whorls at the nodes.
  - Seeds with raised tubercles . . . 3. *M. pentaphylla.*
  - Seeds smooth or nearly so . . . 4. *M. Cerviana.*
- Leaves all radical . . . . . 5. *M. radicaulis.*

1. M. hirta, *Thunb.; F. B. I. ii, 662; Watt E. D.* Glinus lotoides, *Linn.; W. & A. Prod. 362; D. & G. Bomb. Fl. 16.* G. dictamnoides, *Linn.; W. & A. l.c.* Pharnaceum pentagonum, *Roxb.; Fl. Ind. ii, 103.*

A more or less densely hairy annual. *Stems* many, prostrate, spreading from the centre. *Leaves* ½-1 in. long, opposite or falsely whorled, orbicular obovate or narrowly lanceolate, obtuse, usually downy on both surfaces, *petiole* short or 0. *Flowers* in axillary clusters, unequally pedicelled. *Sepals* ¼-½ in., elliptic or oblong, acute, stellate-hairy outside. *Staminodes* linear and deeply 2-fid or 0. *Stamens* 5-10, rarely more. *Styles* 3-5, short. *Capsule* oblong, shorter than the sepals. *Seeds* many, dark-brown, tuberculate, shinning; appendage a small white scale extending from the hilum into a long filiform process which curves over the top of the seed.

Common within the area. DISTRIB. Throughout India and in Ceylon, and in all warm regions of the world. The dried plant is used medicinally in Sind and in the Punjab, and the tender shoots are eaten as a potherb.

2. M. oppositifolia, *Linn.* M. Spergula, *Linn.; W. & A. Prod. 44; F. B. I. ii, 662.* M. verticillata, *Roxb. Fl. Ind, i, 360 (not of Linn.).* Pharnaceum Mollugo, *Linn.; Roxb.; Fl. Ind. ii, 102.*

Glabrous or nearly so, with branching diffuse or prostrate leafy stems with long internodes *Leaves* ½-1 in., usually in whorls, sessile or shortly stalked, spathulate lanceolate or elliptic, apiculate. *Flowers* axillary; *pedicels* very slender. *Sepals* oblong, subacute, often with membranous margins. *Stamens* 3 or 5-10. *Stigmas* 3, minute. *Capsule* 3-celled, oblong-ovoid, a little shorter than the sepals. *Seeds* many, covered with raised tubercular points, appendaged as in *M. hirta.*

Agra dist. (Munro). DISTRIB. Bengal and Cent. Prov. to Ceylon and Burma; also in Trop. Africa and Australia.

3. M. pentaphylla, *Linn.; Roxb.; Fl. Ind. i, 359; W. & A. Prod. 44; D. & G. Bomb. Fl. 16.* M. stricta, *Linn.; W. & A. l. c.; D. & G. l. c.; F. B. I. ii, 663; Watt E. D.* M. triphylla, *Lour.; Roxb.; Fl. Ind. i, 360; W. & A. l. c.*

An erect or diffuse glabrous annual. *Stems* leafy, 4-angular, dichotomously branched. *Leaves* ¾-1½ in., nearly sessile, opposite or whorled, lanceolate and acute to obovate and obtuse, apiculate, much narrowed to the base. *Cymes* terminal, compound, longer than the leaves, *pedicels* filiform. *Sepals* ⅛ in., elliptic or round-oval, obtuse. *Stamens* 3-5, filaments dilated. *Ovary* 3-celled; *styles* 3, short. *Capsule* as long as the sepals, globose, many-seeded, walls thin. *Seeds* tuberculate dark chestnut coloured.

Very common within the area. DISTRIB. Throughout India and in Ceylon, ascending to 5,000 ft. on the Himalaya; also in the Malay Penins., China, Japan and Figi. The plant has medicinal properties, and the leaves are eaten as a potherb.

4. M. Cerviana, *Seringe; W. & A. Prod. 44; F. B. I. ii, 663; Watt E. D.*

A glabrous annual. *Stems* erect, slender, 3-7 in., thickened at the nodes, branches umbellate. *Leaves* often 4-8 in a whorl, ½-¾ in.; radical tufted, spathulate or obovate; canline linear-oblong. *Peduncles* 3-chotomous or umbellate-cymose; *pedicels* long, filiform, rigid. *Sepals* ⅓ in., oval-oblong, obtuse, with membranous margins. *Styles* very small. *Capsule*

as long as the sepals, globose, many-seeded. *Seeds* reddish or yellowish, reticulate, bluntly ridged on back, not appendaged.

Meerut dist. (T. Thomson). DISTRIB. In the drier and hotter parts of India from the Punjab to Ceylon, not in Bengal; also in other parts of Asia and in Africa and Australia. The plant is used medicinally.

5. M. nudicaulis, *Lamk.; W. & A. Prod. 43; F. B. I. ii, 664.*

A slender glabrous annual. *Stems* many, leafless, rising from a tuft of radical leaves. *Leaves* 1-2 in., oblong-spathulate, tapering to the base. *Scapes* 3-8 in., wiry, 3-chotomously branched above. *Sepals* $\frac{1}{16}$ in., oblong or oval, obtuse, with membranous margins. *Stamens* 3 or 5. *Stigmas* 3, very small. *Capsule* as long as the sepals, globose or somewhat ellipsoid, many-seeded. *Seeds* minute, black, shining, closely reticulate, not tuberculate, minutely appendaged at the hilum.

Agra dist. (Duthie), Merwára (Lowrie). DISTRIB. In the drier parts of India from the Punjab to Ceylon, not in Bengal; also in Trop. Africa, New Caledonia and Cuba.

3. GISEKIA, Linn.; Fl. Brit. Ind. ii, 664.

Diffuse branched herbs. *Leaves* opposite or falsely whorled, fleshy, spathulate, abounding in raphides; *stipules* 0. *Flowers* sessile and pedicelled, hermaphrodite or polygamous, small, greenish or purplish, in axillary cymes. *Sepals* 5, nearly free, ovate, herbaceous with membranous margins. *Petals* 0. *Stamens* (in the Indian species) 5, hypogynous. *Carpels* 5-3, distinct, each ending in a short simple style and containing one basal ovule. *Fruit* of 5, free, membranous papillose, indehiscent, carpels. *Seeds* vertical, subreniform; embryo curved.—Species 5, all African, including the following one which extends to India.

G. pharnaceoides, *Linn.; F. B. I. ii, 664; Watt E. D.*

A succulent glabrous herb, with prostrate or ascending branches. *Leaves* $\frac{3}{4}$-1$\frac{1}{2}$ in. long, oblong-spathulate, tapering into a short petiole; *stipules* 0. *Flowers* in dense cymes, *sepals* $\frac{1}{10}$ in., oblong-oval, with membranous margins. *Filaments* dilated below. *Fruit* as long as the sepals of 5 distinct indehiscent 1-seeded carpels. *Seeds* rounded on the back, blackish, covered with pustulate glands.

Meerut and Delhi district (T. Thomson), Agra (Munro), Merwára (Duthie), Bundelkhand (Edgeworth). DISTRIB. In the drier parts of India from the Punjab and Sind to Ceylon; also in Ava, Afghanistan and Africa. The plant has had the reputation of possessing strong anthelmintic properties. It is used sometimes as a potherb.

LVII.—UMBELLIFERÆ.

HERBS, rarely shrubs or trees. *Leaves* alternate, usually divided or dissected, sometimes simple; *petiole* generally sheathing at the base;

stipules 0. *Flowers* hemaphrodite or polygamous, in compound umbels (simple in *Hydrocotyle* and *Buplenrum*), the outer flowers of the umbel sometimes with larger and unequal petals; primary umbels with an involucre of bracts at the base, and the secondary umbels often with a similar involucre of bracteoles. *Calyx-tube* adnate to the ovary; limb 0 or 5-toothed. *Petals* 5, epigynous, often with the apex inflexed, valvate or imbricate. *Stamens* 5, epigynous. *Ovary* inferior, 2-celled, disk 2-lobed; *styles* 2; *stigmas* capitellate; *ovules* 1 in each cell, pendulous. *Fruit* of 2 indehiscent dorsally or laterally compressed carpels, separated by a commissure; *carpels* each attached to and often pendulous from a slender often forked axis (carpophore), with 5 primary ridges (1 dorsal, 2 marginal and 2 intermediate), and often 4 secondary ones intercalated between these; *pericarp* often traversed by oil-canals (vittæ). *Seed* 1 in each carpel, pendulous, albumen cartilaginous.—Species about 1,500, mostly in the temp. regions of the N. Hemisphere, a few tropical and natives of the S. Hemisphere.

Leaves undivided.	
Leaves orbicular or reniform, crenate; umbels simple	1. HYDROCOTYLE.
Leaves linear or oblong, entire; umbels compound	2. BUPLEURUM.
Leaves divided, umbels compound.	
Secondary ridges of fruit inconspicuous or 0.	
Fruit laterally compressed, not winged.	
Umbels leaf-opposed, short-peduncled; bracts and bracteoles 0	3. APIUM.
Umbels terminal and leaf-opposed, bracts and bracteoles present	4. CARUM.
Fruit widest at the commissure, not winged.	
Petals yellow, leaf-segments filiform	5. FŒNICULUM.
Petals white or pink.	
Fruit subglobose, ridges thick, but not corky	6. SESELI.
Fruit ellipsoid; lateral ridges large, triangular, corky	7. ŒNANTHE.
Fruit much dorsally compressed, lateral ridges winged	8. PEUCEDANUM.
Secondary ridges of fruit prominent.	
Fruit glabrous.	
Fruit globose, bracts 0	9. CORIANDRUM.
Fruit narrowly oblong; bracts linear, rigid	10. CUMINUM.
Fruit bristly	11. DAUCUS.

1. HYDROCOTYLE, Linn.; Fl. Brit. Ind. ii, 667.

Prostrate herbs, rooting at the nodes. *Leaves* (in the Indian species) cordate or hastate, not peltate, orbicular or reniform, subentire or palmately lobed, long-petioled; *stipules* small, scarious. *Umbels* (in the Indian species) simple, small; *bracts* small or 0; *flowers* white, sometimes unisexual. *Calyx-teeth* 0 or minute. *Petals* entire, valvate or imbricate. *Fruit* laterally compressed, commissure narrow; *carpels* laterally compressed or subpentagonal; lateral primary ridges concealed within the commissure, or distant therefrom and prominent; vittæ 0 or obscure; *carpophore* 0. *Seed* laterally compressed.—Species 70 to 80, growing in wet places in tropical and temperate regions, more numerous in the S. Hemisphere.

Petals acute, valvate, secondary ridges of fruit 0, pericarp thin.	
Leaves 1-3 in. in diam., peduncles often clustered	*1. H. javanica.*
Leaves ¼-1 in. in diam., peduncles solitary	*2. H. rotundifolia.*
Petals obtuse, imbricate, all the ridges of fruit similar and vein-like, pericarp thickened	*3. H. asiatica.*

1. H. javanica, *Thunb.; F. B. I. ii, 667.* H. zeylanica, *DC.; W. & A. Prod. 366.* H. polycephala, *W. & A. l. c.*

Stems long, succulent, slightly pubescent, with erect flexuose branches. *Leaves* 1-3 in. in diam., reniform, cordate, crenate and often lobed, shining on both sides; *stipules* large, membranous. *Peduncles* ¼-2 in.; lower solitary, leaf-opposed, upper often clustered. *Umbels* many-flowered; *bracts* minute, scattered among the pedicels. *Petals* lanceolate, acute, valvate. *Fruit* $\frac{1}{10}$ in., orbicular or subquadrate, much compressed, sometimes deformed; lateral primary ridges commissural, intermediate ones 0; *pericarp* hard, thin.

Dehra Dun. DISTRIB. Outer Himalaya from Kashmir to Bhután and on the Khasia Hills up to 8,000 ft., S. India, Ceylon, Burma, Malaya, Philippines and Australia. The plant is used medicinally.

2. H. rotundifolia, *Roxb. Hort. Beng. 21; Fl. Ind. ii, 88; F. B. I. ii, 668.* H. tenella, *Don; W. & A. Prod. 366.*

Stems filiform, glabrous. *Leaves* ¼-1 in. diam., orbicular in outline, cordate, lobed to or beyond the middle, shining, glabrous or somewhat hairy on both surfaces. *Peduncles* very short; *bracts* minute. *Umbels* 8-10-flowered. *Flowers* minute, nearly sessile, pink. *Petals* lanceolate, acute, valvate. *Fruit* $\frac{1}{15}$ in., rather broader than long, somewhat compressed, 5-gonal, smooth, sometimes punctate; *pericarp* hard, thin.

Sub-Himalayan tract from Dehra Dun to N. Oudh. DISTRIB. W. Him. up to 7,000 ft., Bengal, Sikkim and Khasia Hills, S. India and Ceylon; also Trop. Africa.

3. H. asiatica, *Linn.; Roxb.; Fl. Ind. ii, 88; W. & A. Prod. 366; D. & G. Bomb. Fl. 105; F. B. I. ii, 669; Watt. E. D.*—Asiatic Penny-wort.

Leaves ½-2½ in., long-petioled, reniform or orbicular, crenate and often lobed, glabrous or nearly so and shining; *stipules* adnate to petioles. *Peduncles* much shorter than the leaves, often 2-3-nate, pubescent; *bracts* small, ovate, embracing the flowers, not scattered among the pedicels as in the two preceding species. *Flowers* 3-6 in each head, sessile. *Petals* minute, ovate, acute, slightly imbricate. *Fruit* ⅛-⅙ in.; *carpels* oblong, subcylindric, curved, much longer than broad, slightly compressed, reticulate-rugose, each with 9 curvilinear subsimilar ridges and 2 within the commissure; *pericarp* thickened, woody, white.

Common within the area. DISTRIB. Throughout India from the base of the Himalaya to Ceylon and Malaya, and in all tropical and subtropical regions of the world. The plant is valued medicinally as a beneficial remedy in certain forms of leprosy, and the leaves are eaten in times of scarcity.

2. BUPLEURUM, Linn.; Fl. Brit. Ind. ii, 674.

Glabrous herbs or shrubs. *Leaves* entire. *Umbels* compound; *bracts* and *bracteoles* foliaceous, or setaceous, or 0. *Flowers* yellow or lurid, pedicelled or subsessile. *Calyx-teeth* 0. *Petals* obovate, emarginate. *Styles* short. *Fruit* laterally compressed, slightly constricted at the commissure; *carpels* terete or sub-5-gonal; primary ridges distinct, sometimes subalate, rarely obscure; secondary 0 or obscure; *vittæ* 1-3 between the primary ridges, rarely 0 or many; *carpophore* entire 2-fid. or 2-partite. *Disk* depressed, rarely prominent in fruit. *Seed* terete, sometimes slightly grooved on the inner face.—Species upwards of 75, in Europe, temp. and subtrop. Asia; 1 S. African, and 1 Arctic American.

Leaves 4-10 in. long, all linear and acuminate	*1. B. falcatum var. marginata.*
Leaves 1-3 in. long, obtuse, the lower linear, the upper linear-oblong	*2. B. tenue.*

1. B. falcatum, *Linn.; var.* marginata, *F. B. I. ii, 676; Watt E. D.* B. marginatum, *Wall.*

Stems erect, 1-4 ft. *Leaves* linear, slightly broader upwards; cauline ½ amplexicaul or sessile, not widened at base, acuminate, margins prominently cartilaginous. *Bracts* small or 0; *bracteoles* 4-5, narrow-lanceolate, shorter than the fruiting umbel. *Rays* 5-8, 1½ in.; *pedicels* 5-15, very short. *Fruit* ⅛-⅙ in., brown when ripe; *carpels* terete, narrowly oblong; ridges not prominent, furrows 3-vittate; *disk* yellow or brownish, not prominent.

Dehra Dun (King, Duthie). DISTRIB. Himalaya from Kashmir to the Khasia Hills. The most frequent form of *B. falcatum*. The plant is supposed to have stimulant properties, and the root is eaten.

2. B. tenue, *Buch.-Ham. ex Don Prod. 182; Royle Ill. 228. F. B. I. ii, 677.*

Stems 1-3 ft. Solitary, erect, much branched upwards. Lower *leaves* linear, upper linear-oblong, all obtuse and narrowed to the base. *Umbels* numerous; *bracts* 1-4, not prominent; *bracteoles* 4-5, about as long as the fruiting umbellules. *Rays* of umbel 3-8, slender *pedicels* very short. *Fruit* broadly oblong, reddish-brown when ripe; *carpels* terete, ridges prominent; *vittæ* solitary in each furrow, often obscure.

Dehra Dun and Siwalik range. DISTRIB. Himalaya from Kashmir to Sikkim, very common on the outer ranges of W. Him.

3. APIUM, Linn.; Fl. Brit. Ind. ii, 678.

Herbs, annual or perennial, glabrous. *Leaves* pinnate 3-partite or compound. *Umbels* compound, often leaf-opposed. *Bracts* and *bracteoles* 0 (in the Indian species). *Flowers* white. *Calyx-teeth* obsolete. *Petals* ovate, acute, tip inflexed. *Fruit* orbicular or elliptic, slightly longer than broad, laterally subcompressed; *carpels* semiterete, subpentagonal, plane on the inner face; primary ridges distinct, filiform; secondary 0; furrows 1-vittate *Seed* semiterete.—Species about 20, scattered throughout the world.

A. graveolens, *Linn.; W. & A. Prod. 367; Royle Ill. 229; F. B. I. ii, 679; Watt E. D.; DC. L'Orig. Pl. Cult. 71; Watt. E. D.*—Vern. *Ajmud.* (Wild Celery).

Biennial. *Stems* 1-8 ft., erect, branching. Radical *leaves* pinnate, with large deeply lobed segments, cauline 3-partite; segments once or twice trifid, coarsely toothed at the apex. *Peduncle* ¼ in. or less, leaf-opposed. *Umbel-rays* 5-10, *pedicels* 6-16. *Fruit* $\frac{1}{16}$-$\frac{1}{12}$ in.; *ridges* narrow, *vittæ* broad.

Dehra Dun (Gamble), Banda (Edgeworth), in wet ground. DISTRIB. Punjab Hills, also in Afghanistan, W. Asia, Europe, N. Africa and Abyssinia. The root and seeds are used medicinally. The poisonous properties of the wild plant are removed by cultivation. The seed is eaten as a spice by natives, and the blanched stems and leaf-stalks by Europeans. A turnip-rooted variety is also eaten boiled as a vegetable.

4. CARUM, Linn.; Fl. Brit. Ind. ii, 680.

Herbs, perennial or annual. *Leaves* pinnate or decompound. *Umbels* compound; *bracts* simple or divided, *bracteoles* simple. *Flowers* white (in the Indian species), polygamous, sterile flowers often with enlarged or irregular petals. *Calyx-teeth* small or 0. *Petals* retuse.

or emarginate. *Fruit* ovoid ellipsoid or oblong, laterally compressed and more or less constricted at the commissure ; *carpels* terete, sub-*pentagonal, plane on inner face, primary ridges* slender, conspicuous *or obscure, lateral commissural, furrows* 1-*vittate* ; *carpophore* 2-fid *or partite.—Species about 50, in Europe, Temp. Asia, S. Africa and N. America.*

The genus, as here defined, includes *Petroselinum*, *Bunium* and *Ptychotis*.

Ultimate segments of lower leaves linear-lanceolate, of upper linear.	
Fruit very small minutely pubescent or more or less hispidulous, ridges faint	1. *C. stictocarpum.*
Fruit $\frac{1}{10}$-$\frac{1}{2}$ in. long, hispid, ridges distinct	2. *C. Roxburghianum*
Ultimate segments of all the leaves linear ; fruit muricate, subhispid	3. *C. copticum.*

1. C. stictocarpum, *C. B. Clarke in F. B. I. ii, 681.*

Glabrous or minutely hairy. *Root* fusiform. *Stem* 1-3 ft., much branched. *Leaves* 2-pinnate ; ultimate segments of lower leaves linear lanceolate, those of the upper ones often linear. *Bracts* 3-6, nearly linear ; *bracteoles* 4-8, linear-lanceolate with scarious ciliate margins. *Rays* of umbel 6-12, equal ; *pedicels* 8-20. *Ovary* minutely pubescent. *Fruit* very small, ovoid, minutely pubero-punctate, ultimately shining, yellow ; *ridges* faint ; *vittæ* solitary small.

Dehra Dun, abundant near Rajpur. DISTRIB. Mt. Abu in Rájputana, and in the Konkan. The fruit of the Dehra Dun plant is densely hispidulous, and should no doubt be referred to the var. *hebecarpa* described by Mr. Clake in F. B. I. l.c. It flowers and fruits in Oct.

2. C. Roxburghianum, *Benth. & Hk. f. Gen. Pl. i, 891 ; F. B. I. ii, 682 ; Field & Gard. Crops part iii, 39 ; Watt E. D.* Apium involucratum, *Roxb. ; Fl. Ind. ii, 97.* Pimpinella ? involucrata, *W. & A. Prod. 369 ; D. & G. Bomb. Fl. 106.* Ptychotis involucrata, *Royle Ill. 229.*—Vern. *Ájmud, ájmod.*

An annual about 3 ft. high. *Root* fusiform. Ultimate segments of lower leaves rather broad, of the upper narrowly linear-lanceolate. *Bracteoles* 4-8, subulate, with scarious ciliate margins. *Fruit* $\frac{1}{10}$-$\frac{1}{12}$ in. long, hispid.

Cultivated in native gardens for the sake of its aromatic fruits, which are used in flavouring curries, and also medicinally as a carminative stimulant in dyspepsia. The leaves form an indifferent substitute for *parsley*. It has not been met with in a wild state, and Mr. Clarke says (F. B. I. l.c.) that it is probably a cultivated form of his *C. stictocarpum*, which it exactly resembles except in regard to the fruit. This, he says,

shows a wide difference in size, colour and hairiness in the two forms, but the variety *hebecarpa* of *C. stictocarpa* forms a connecting link.

3. C. copticum, *Benth. & Hk. f. Gen. Pl. i. 891; F. B. I. ii, 682; Field & Gard. Crops part iii, 38, t. lxxiii; Watt E. D.* Ligusticum Ajouan, *Roxb.; Fl. Ind. ii, 91.* Ptychotis Ajowan, *DC.; W. & A. Prod. 368; Royle Ill. 229.*—Vern. *Ajwain.* (Bishop's weed.)

An erect annual, 1-3 ft. high, glabrous or minutely pubescent. *Leaves* rather distant, 2-3-pinnate; ultimate segments ½-1 in., all linear. *Bracts* usually many, linear, sometimes divided; *bracteoles* 3-5, small, linear. *Rays* of umbel pubescent. *Flowers* pure white. *Fruit* ⅛ in., ovoid, muricate, subhispid, *carpels* dorsally compressed, *ridges* distinct; *vittæ* solitary, small.

Cultivated in most native gardens within the area, and in other parts of India, especially in Bengal; it is also grown in Afghanistan, Persia and Egypt, from which country it is said to have been introduced into Europe. It is found occasionally as an escape, but nowhere has it been observed truly wild. The fruits are much prized for their medicinal properties and as a spice.

C. Carui, L., yields the so-called Carraway seeds; and parsley, which is grown to some extent in the gardens of Europeans in India, is *C. Petroselinum*, Benth., a native of the Mediteranean region.

5. FŒNICULUM, Adans.; Fl. Brit. Ind. ii, 695.

Tall glabrous herbs, sometimes annual. *Leaves* 2-3-4-pinnate, ultimate segments linear. *Bracts* 0; *bracteoles* 0, or few small and linear. *Calyx-teeth* 0. *Petals* yellow, emarginate. *Fruit* not laterally compressed, oblong or ellipsoid; *carpels* ½-terete; *ridges* prominent, subequal; *furrows* 1-vittate; *carpophore* 2-partite. *Seed* somewhat dorsally compressed, inner face slightly concave.—Species 3 or 4, from the Canary Islands to W. Asia, 1 widely cultivated.

F. vulgare, *Mill.; W. & A. Prod. 371; F. B. I. ii, 695; Watt E.D.; Field & Gard. Crops, part iii, 43, t. lxxxii.* F. Panmorium, *DC.; Royle Ill. 229.* Anethum Panmori, *Roxb; Fl. Ind. ii, 94.* Ozodia fœniculacea, *W. & A. Prod. 375.*—Vern. *Saunf.* (Fennel.)—Extensively cultivated in garden patches within the area during the cold season. The root is used as a purgative, the leaves as a potherb, and the fruits medicinally as a carminative. A small annual form, known as *pan-muhori* (F. Panmorium, *DC.*), is largely grown in Bengal, and the natives eat the fruits with their betel, and also in curries. Fennel is found wild in W. & S. Europe, and is widely cultivated in many parts of the world.

6. SESELI, Linn.; Fl. Brit. Ind. ii, 693.

Herbs, glabrous or pubescent. *Leaves* 2-3-pinnate or twice 3-partite. *Umbels* compound; *bracts* 0 few or many, undivided or

pinnate; *bracteoles* several or many. *Calyx-teeth* minute, lanceolate or linear, or 0. *Petals* emarginate, white. *Fruit* oblong, ovate or circular, not laterally compressed, broadest at the commissure; *carpels* ½-terete, inner face plane; *ridges* strong, obtuse or subacute, lateral hardly larger than the dorsal; *vittæ* in each furrow solitary, usually prominent; *carpophore* 2-partite, 2-fid or entire; *disk* not prominent on the fruit.—Species about 40, chiefly in the N. Temp. zone of the old world.

S. indicum, *W & A. Prod. 371; F. B. I. ii, 693; Watt E.D.* Ligusticum diffusum, *Roxb.; Fl. Ind. ii, 92.*

An erect or diffuse annual, 4-12 in. high. Lower *leaves* 2-pinnate, secondary pinnæ ovate, lobed, hispidly pubescent. *Bracts* 4-5, ½in. narrowly lanceolate, caudate, pubescent; *bracteoles* similar, but smaller. *Flowers* white or pink. *Calyx-teeth* 0. *Fruit* $\frac{1}{12}$-$\frac{1}{10}$ in., sub-globose, glabrous or hispid; *ridges* thick, often pale-yellow; *carpels* ½-terete, *vittæ* distinct, *carpophore* entire, *disk* prominent, *styles* spreading.

Sub-Himalayan tracts from Dehra Dun to Gorakhpur, also in Bundelkhand. DISTRIB. Assam, Central Bengal and Coromandel Coast. The carminative fruits are sometimes used as a medicine for cattle.

7. ŒNANTHE, Linn.; Fl. Brit. Ind. ii, 695.

Herbs, growing in wet places. *Stems* creeping or stoloniferous, (in Indian species). *Leaves* 1-3-pinnate, ultimate segments large or linear or minute, rarely reduced almost to sheaths. *Umbels* compound; *bracts* 0-1 (in Indian species); *bracteoles* several, linear. *Flowers* white often polygamous, males sometimes radiant. *Calyx-teeth* small, acute. *Petals* emarginate. *Fruit* glabrous, ellipsoid, longer than broad, or globose, nearly terete, commissure broad; *carpels* ½-terete, dorsally compressed, inner face plane; lateral primary ridges large, triangular, corky; dorsal and intermediate primary ridges much smaller, sometimes obsolete, or all subequal; *furrows* 1-vittate; *carpophore* 0; *disk* usually not prominent. *Seed* terete or dorsally compressed, inner face plane.—Species about 30, found in the N. Hemisphere and in S. Africa.

Œ. stolonifera, *Wall.; F. B. I. ii, 696.* Phelandrium stoloniferum, *Roxb.; Fl. Ind. ii, 93.* Dasyloma latifolium, *Lindl. in Royle Ill. 232.*

A stoloniferous herb, glabrous or nearly so. *Stems* 2-4 ft., decumbent, often floating, rooting freely from many of the lower nodes. *Leaves* 1-2-pinnate, or 3-partite; secondary pinnæ lanceolate or rhomboid-lanceolate, serrate or lobed; ultimate segments 1-2 in., those of the upper leaves never linear. *Peduncles* usually elongate. *Rays* stout. *Carpels* ⅛-in., subquadrate-ellipsoid, scarcely longer than broad;

dorsal and intermediate ridges usually distinct, but not prominent. *Seed* nearly circular in horizontal section.

Common in wet places within the area. DISTRIB. Plains of Punjab and Bengal, ascending to 5,000 ft. on the Himalaya, Assam, Burma; also in Java, China and Japan.

VAR. corticata, *F. B. I. l.c.* Œ. corticata *Edgew.*—*Leaves* often simply 3-partite. *Fruit* subglose, smaller. Banks of the Delhi Canal (Edgeworth), Moradabad (T. Thomson).

8. PEUCEDANUM, Linn.; Fl. Brit. Ind. ii, 708.

Perennial glabrous or pubescent herbs (the Indian species). *Leaves* 1-3-pinnate or twice or thrice 3-partite, ultimate leaflets lanceolate or ovate, rarely linear, toothed or entire. *Umbels* compound, *rays* usually numerous; *bracts* various, *bracteoles* many few or 0. *Flowers* often polygamous, usually white or yellow. *Calyx-teeth* obsolete or small. *Petals* obovate, emarginate or 2-fid. *Ovary* glabrous. *Fruit* much dorsally compressed, ellipsoid, oblong or orbicular; *carpels* scarcely convex on the back, more or less acutely winged on the margin, dorsal and marginal ridges little elevated or obsolete, lateral winged; dorsal furrows 1-vittate, lateral 1-rarely 2-vittate. *Seed* much dorsally compressed, inner face plane.—Species about 160, throughout the greater part of the world, few tropical.

1. P. graveolens, *Benth. & Hk. f. in Gen. Pl. i, 919; F. B. I. ii, 709; Field & Gard. Crops part iii, 45, t. xc; Watt E. D.* Anethum Sowa, *Roxb.; Fl. Ind. ii, 94; W. & A. Prod. 372; Royle Ill. 229.* —Vern. *Sowa* (*Dill*).

A glabrous perennial herb, 1-3 ft. high. *Leaves* 2-3-pinnate; ultimate segments ½-1 in., linear. *Bracts and bracteoles* 0; *pedicels* many. *Petals* yellow. *Styles* small. *Fruit* ⅛ by $\frac{1}{12}$ in., narrowly winged, 2-3 times as broad as thick; dorsal intermediate ridges distinct, slender; *vittæ* large, solitary in each furrow, 2 on the commissure.

Cultivated as a cold-weather crop throughout the greater portion of the area for its fruits, which form an important ingredient in curries. The leaves are also used as a potherb. The fruit is used medicinally by the natives, also for colic in horses. The plant is sometimes met with as a weed of cultivation.

2. P. Dana, *Buch.-Ham.; F. B. I. ii, 709.*

A glabrous perennial herb. *Stems* 6-24 in., naked upwards. *Leaves* twice or thrice 3-partite, or sub-2-pinnate; ultimate segments up to 2 in. long, linear oblong or ovate, entire or sparingly toothed. *Bracts* 3-5, ¼-in. long, linear or linear-lanceolate. *Rays* 5-10, *bracteoles* 4-5, linear; *pedicels* many, ¼-in. *Flowers* small, yellow. *Calyx-teeth* obsolete. *Styles*

long. *Carpels* ¼-in., much compressed, subquadrate; dorsal and intermediate *ridges* filiform, obscure; lateral with a wing as thick as the seed; dorsal *furrows* 1-vittate, lateral 2-vittate, *vittæ* nearly as long as the carpels.

Siwalik range, and in the Sub-Himalayan tracts from Dehra Dun to Gorakhpur. DISTRIB. W. Himalaya on open grassy hill-sides up to 7,000 ft., also in N. Bengal.

9. CORIANDRUM, Linn.; Fl. Brit. Ind. ii, 717.

Glabrous annuals. *Leaves* decompound. *Umbels* compound, *rays* few; *bracts* 0, or small and linear; *bracteoles* few, filiform. *Calyx-teeth* small, acute, often unequal. *Petals* obovate, emarginate, white or purplish, those of the outer flowers unequal, often radiant. *Fruit* subglobose; *ridges* not prominent; *vittæ* obscure, solitary, under the secondary ridges; *carpels* slightly concave on the inner face, commissure distinctly 2-vittate, *carpophore* 2-partite. *Seed* convexo-concave, about thrice as broad as thick.—Species 2, in S. Eur., N. Africa and Arabia.

C. sativum, *Linn.; Roxb.; Fl. Ind. ii, 94; F. B. I. ii, 717; Field & Gard. Crops part iii, 40, t. lxxvi; Watt E. D.*—Vern. *Dhanya* (Coriander). —Upper segments of the lower leaves ovate or lanceolate, of the upper linear. Much cultivated in native gardens during the cold season for the sake of the fruits and leaves, and it also occurs as an escape. Although widely distributed throughout the warmer parts of the world its native country is not known for certain, but it has been reported as growing wild in Greece and in the region of the Caucasus. The fruits are used as a flavouring ingredient in curries and confectionery, as well as medicinally, and the leaves are eaten as a potherb.

10. CUMINUM, Linn.; Fl. Brit. Ind. ii, 717.

A slender annual, glabrous except the fruit. *Leaves* twice or thrice 3-partite, ultimate segments filiform. *Umbels* compound, *rays* few; *bracts* and *bracteoles* several, linear, rigid. *Calyx-teeth* small, subulate, unequal. *Petals* oblong or obovate, emarginate, white, often unequal. *Fruit* cylindric, tip narrowed; primary *ridges* filiform, distinct, secondary usually hispidulous; *vittæ* large, solitary under each secondary ridge; *carpophore* 2 partite or 2-fid. *Seed* somewhat dorsally compressed, convex-concave.—A single species.

C. Cyminum, *Linn.; Roxb.; Fl. Ind. ii, 92; W. & A. Prod. 373; Royle Ill. 229; F. B. I. ii, 718; Watt E. D.; Field & Gard. Crops part iii, 40.*

—Vern. *Zira, zira sufed.* (Cumin.)—There is no reliable information as to the extent to which this plant is cultivated in India. The only official mention of its being grown at all within the area of this flora is to be found in the Gazetteers of the Agra and Furakhabad districts, and in both these instances, it is very probable that some other plant is intended. The vernacular name, *zira* or *jira*, is also applied to the Carraway (Carum Carui), whilst the *kalajira* (Nigella sativa) is also grown in many parts of India, and its seeds are used for similar purposes. The similarity of vernacular names may thus account for many conflicting statements. The fruits of *cumin* are largely imported into India by way of Persia. In Engl. and Prantl Pflanzenf. Vol. iii, part 8, the plant is said to be wild in Egypt, the Mediterranean region and in Turkestan. In the Saharanpur bazar the seeds of *Plantago pumila, Willd.* are sold under the name of *zira* as a substitute for *cumin*, and Royle (l.c.) mentions having raised plants of the former from seed bought in the bazar. The fruits of *cumin* resemble very much those of the *Carraway*, but they are larger and of a lighter colour, and each half of the fruit has nine ridges instead of five. They are much valued by the natives for their medicinal properties.

11. DAUCUS, Linn.; Fl. Brit. Ind. ii, 718.

Annual or biennial herbs, usually hispid. *Leaves* 2-4-pinnate, ultimate segments narrow or small. *Umbels* compound, *rays* usually many, pinnate; *bracts* generally very many, *bracteoles* many, 3-fid., entire or 0. *Calyx-teeth* small or obsolete. *Petals* obovate, emarginate, white, outer often radiant. *Fruit* elliptic, terete or somewhat dorsally compressed, *ridges* all prominent, all or the secondary only bristly, lateral primary little developed; *vittæ* solitary, under the secondary ridges, *carpophore* undivided or 2-fid. *Seed* ½-terete, dorsally subcompressed, inner face plane.—Species mostly Mediterranean and temp. Asiatic, 2 in N. Amer. and 1 Australian.

D. Carota, *Linn.; Roxb., Fl. Ind. ii, 90; W. & A. Prod. 374; Royle Ill. 229; F. B. I. ii, 718; Field & Gard. Crops part iii, 9, t. lxxviii; Watt E. D.*—Vern. Gájar (The Carrot.)—A hispid herb, 1-4 ft. high. *Leaves* 2-3-pinnate; pinnæ pinnatifid, segments narrow-lanceolate. Outer *rays* connivent in fruit; *bracteoles* many, 3-fid and simple. *Fruit* $\frac{1}{10}$ in.; bristles of secondary ridges long, glistening white, connate at base only, of the primary ridges small, subglochidiate, carpophore undivided. The carrot is extensively grown within the area as a cold-weather crop. The acclimatized variety as grown by the natives for their own use has a large greenish-white root, coarse and flavourless. It is, however, hardy and prolific, and on this account has proved of inestimable value as an emergent food-crop during times of scarcity. Excellent carrots are nevertheless obtainable in India from annually imported seed. The plant is found wild in Europe, and extends through W. Asia westwards to Kashmir and along the Himalayan ranges within the temperate zone.

LVIII.—ARALIACEÆ.

TREES or shrubs, very rarely herbs, sometimes scandent, or scandent only when young, often prickly. *Leaves* alternate, the uppermost rarely subopposite, long-petioled, large, simple or compound; *stipules* adnate to the petiole, sometimes inconspicuous or 0. *Flowers* regular, small, sometimes polygamous, in umbels racemes or panicled heads; *bracts* and *bracteoles* small or conspicuous; *pedicels* continuous with the base of the calyx or jointed. *Calyx-tube* adnate to the ovary; limb truncate, obsolete or with small teeth. *Petals* 5, rarely 6-7 or many, valvate or subimbricate, expanding or deciduous in a cap. *Stamens* as many as and alterneate with the petals, rarely indefinite, inserted round an epigynous disk. *Ovary* inferior, 2-celled, or cells as many as the stamens, rarely 1-celled; *styles* as many as the cells, distinct or united; *ovules* solitary and pendulous in each cell. *Fruit* a drupe or berry, usually small, one or more cells sometimes suppressed. *Seeds* pendulous, albumen uniform or ruminated.—Species about 400, chiefly tropical or subtropical, a few in cool temperate zones.

Albumen uniform, ovary 5-6-celled, leaves digitate	1. HEPTAPLEURUM.
Albumen ruminated. Ovary 2-celled.	
Styles distinct, leaves pinnately decompound	2. HETEROPANAX.
Styles combined, leaves digitate .	3. BRASSAIOPSIS.
Ovary 5-celled, styles combined; leaves simple, entire or lobed. . . .	4. HEDERA.

1. HEPTAPLEURUM, Gaertn.; Fl. Brit. Ind. ii, 727.

Large shrubs or trees, glabrous or tomentose, without prickles. *Leaves* digitate, rarely compound-digitate or 1-foliolate; *leaflets* coriaceous, entire or remotely toothed or lobed, never closely serrate nor ciliate, those nearest the panicle usually entire; *stipules* often connate within the petiole and prominent. *Umbels* (rarely capitate) panicled or in compound racemes; *bracts* woolly, deciduous or persistent; *pedicels* not jointed under the flower, *bracteoles* few or 0, or rarely densely tufted. *Calyx*-margin toothed or truncate. *Petals* 5-6 or many, valvate. *Stamens* as many as the petals. *Ovary*-cells as many

as the petals, *disk* small or large; *styles* small, separate or combined in a short conical narrow cylindric column. *Fruit* subglobose, 5-6-angled. *Seeds* compressed; *albumen* uniform.—Species 55, in the tropics of the Old World.

H. venulosum, *Seem.; Brand. For. Fl. 249; F. B. I. ii, 729, Watt E. D.* Paratropia venulosa, *W. & A. Prod. 377.* Aralia digitata, *Roxb. Fl. Ind. ii, 107.*—Vern. *Kath-semal* (Dehra Dun).

A soft-wooded shrub, usually scandent. *Leaves* digitate; common *petiole* 5-6 in., slender, terete; *leaflets* 5-7, unequally stalked, 4 by 2 in., elliptic or oblong-lanceolate, acuminate, subacute or rounded at the base, entire, coriaceous, glabrous and shining, conspicuously and minutely reticulate. *Panicles* usually shorter than the leaves, but varying in length, usually glabrous; bracts large, ovate, cadacous, hairy when young. *Flowers* about $\frac{1}{6}$ in. diam., cream-coloured, arranged in paniculate umbels. *Berry* 5-celled, ovoid, bluntly 5-ridged, glabrous, yellow when ripe.

Dehra Dun and Bijnor forests. DISTRIB. Up to 4,000 ft. on the W. Himalaya, Bengal, C. & S. India, Burma & Malaya; also in Trop. Australia. Flowers in Jan. & Feb.

2. HETEROPANAX, Seem.; Fl. Brit. Ind. ii, 734.

A small unarmed tree. *Leaves* glabrous or nearly so, very large, pinnately decompound; *stipules* not prominent. *Panicles* large; *umbels* racemed, more or less stellate-hairy; *bracts* small, ovate, obtuse persistent; *pedicels* not jointed under the flower. *Flowers* polygamous, the terminal umbel of each panicle-branch usually alone fruiting. *Calyx*-margin nearly entire. *Petals* 5, valvate. *Stamens* 5. *Ovary* 2-celled; *styles* 2, distinct from the base, spreading. *Fruit* much laterally compressed, 2-seeded. *Seeds* compressed; *albumen* ruminated.—Species 1 or 2, Western Himalaya, and Indo-China.

H. fragrans, *Seem.; Brand. For. Fl. 249; F. B. I. ii, 734; Watt E. D.* Panax fragrans, *Roxb.; Fl. Ind. ii, 76; Royle Ill. 233.*—Vern. *Tarla.*

A small soft-wooded tree. *Leaves* 2-4 ft. long; *leaflets* shortly stalked or sessile, 3-6 in. long, ovate or elliptic, shortly acuminate, rounded or tapering at the base, entire, glabrous. *Flowers* subsessile, in terminal compact subglobose paniculate umbels, yellow, fragrant; *pedicels* elongating in fruit. *Fruit* ¼ in. long, laterally compressed, at length glabrous, often glaucous.

Dehra Dun and Saharanpur Siwaliks, and in the Sub-Himalyan tracts eastwards. DISTRIB. Eastwards to Burma, common in Bengal, also in Java & China Flowers Jan. & Feb. On this tree the *Eri* silkworm is fed in Upper Assam.

3. **BRASSAIOPSIS,** Dcne. and Planch.; Fl. Brit. Ind. ii, 735.

Large shrubs or trees, glabrous or tomentose, armed or not. *Leaves* digitate palmate or angled; *stipules* connate with the petiole, not prominent. *Umbels* in large compound panicles, young parts at least stellately tomentose; *bracts* often persistent; *pedicels* rising from a dense cluster of persistent bracteoles, not jointed under the flower. *Flowers* often polygamous. *Calyx* 5-toothed. *Petals* 5, valvate. *Stamens* 5. *Ovary* 2-celled; *styles* 2, united. *Fruit* broadly globose or turbinate, 2 or 1-seeded. *Seed* not compressed, *albumen* ruminated.—Species 11, of which 10 are found in India.

B. aculeata, *Seem.; F. B. I. ii, 738.* Hedera aculeata, *Don. Prod. 187.*

A small prickly tree with digitate leaves; *leaflets* subsessile, 9 in. long, narrowly lanceolate-obovate, acuminate, narrowed to the base, softly herbaceous, stellate-tomentose on both surfaces, apex of petiole hispid. *Panicles* large; *bracts* at the base of the branches ovate, persistent; *pedicels* springing from a dense cluster of lanceolate hairy persistent bracteoles. *Fruit* globose, ¼ in. in diam., subdidymous, *disk* flat. *style* ⅛-¼ in.

Dehra Dun (Falconer). DISTRIB. W. Himalaya from Garhwal to Nepal up to 5,000 ft., and on the Khasia Hills.

4. **HEDERA,** Linn.; Fl. Brit. Ind. ii, 739.

Shrubs, climbing extensively, or small trees. *Leaves* simple or lobed, exstipulate, glabrous. *Flowers* polygamous; *umbels* panicled; *bracts* very small, *pedicels* not or very obscurely jointed under the flowers. *Calyx*-margin 5-toothed or subentire. *Petals* 5, valvate. *Stamens* 5. *Ovary* 5-celled; *styles* connate into a column. *Fruit* globose, almost berried. *Seeds* ovoid; albumen ruminated.

H. Helix, *Linn.; Roxb. Fl. Ind. (ed. Carey & Wall.) ii, 515; Brand. For. Fl. 248; F. B. I. ii, 739; Watt E. D.* (Ivy).

Stems glabrous, climbing adhesively by means of numerous extra-axillary rootlets. *Leaves* 3-4 in., variously lobed or pinnatifid or often quite entire. *Umbels* subglobose, sometimes depressed; *bracts* triangular; *pedicels* stellately hairy; *bracteoles* minute or 0. *Fruit* yellow, turning to black when quite ripe.

Dehra Dun, in shaded swamps. DISTRIB. Throughout the Himalaya up to 10,000 ft., Khasia Hills up to 6,000 ft., Salt range of Punjab, extending through Afghanistan to N. Africa and Europe, and from W. Asia to Japan. Flowers Oct. to April.

LIX.—CORNACEÆ.

Shrubs or trees. *Leaves* opposite or alternate, generally petioled, entire or occasionally angular lobed or serrate, frequently unequal at the base; *stipules* 0. *Flowers* usually small, regular, hermaphrodite or 1-sexual, in axillary or terminal cymes panicles or heads. *Calyx-tube* adnate to the ovary; limb truncate or 4-5-toothed, persistent, *Petals* 0 or 4-5 (occasionally indefinite), epigynous, imbricate or valvate. *Stamens* inserted with the petals and equal to them in number, rarely twice or thrice as many. *Ovary* inferior, 1-4-celled, crowned by a usually fleshy sometimes inconspicuous disk; *style* single, short or long, *stigma* capitate or branched; *ovules* solitary (very seldom 2-3), pendulous from the apex of the cell. *Fruit* generally succulent, 1-4-celled, less often with 2 pyrenes. *Seed* oblong, pendulous; *albumen* copious, fleshy.—Species about 90, widely scattered, but most abundant in the N. Hemisphere.

Stamens twice or thrice as many as the petals, cotyledons crumpled . . .	1. ALANGIUM.
Stamens as many as the petals, cotyledons flat	2. MARLEA.

1. ALANGIUM, Lamk.; Fl. Brit. Ind. ii, 741.

Shrubs or small trees, armed or not. *Leaves* alternate, petioled, oblong, entire, 3-nerved at the base, persistent. *Flowers* in axillary fascicles or condensed cymes, hermaphrodite, silky, white, jointed on the pedicel; *bracts* 0. *Calyx-tube* adnate to the ovary, limb 5-10-toothed or truncate *Petals* 5-10, linear-oblong, valvate, becoming reflexed. *Stamens* twice as many as the petals or more, *filaments* hairy; *anthers* very long. *Ovary* inferior, 1-celled, surmounted by a disk; *style* very long; *stigma* large, capitate; *ovule* pendulous. *Fruit* a berry, crowned by the somewhat enlarged calyx-limb. *Seed* oblong; *albumen* ruminated, cotyledons crumpled.—Species 2 or 3, in tropical and sub-tropical Asia and Africa.

A. Lamarckii, *Thwaites; D. & G. Bomb. Fl. 109; Brand. For. Fl. 250; F. B. I. ii, 741; Watt E. D.* A. decapetalum, *Lamk.; W. & A. Prod. 325.* A. hexapetalum, *Lamk.; Roxb. Fl. Ind. ii, 502; W. & A. Prod. 326.*—Vern. *Akola, ankara, bismár* (Saharanpur).

A shrub or small tree with grey bark, often spinescent. *Leaves* 3-6 in., alternate, oblong or elliptic, acute or subobtuse, unequally rounded at

the base, nearly glabrous above, pubescent on the nerves beneath; *petiole* ¼ in., villous or rusty-tomentose. *Flowers* solitary or fascicled, white, fragrant; *peduncles pedicels* and *calyx-tube* usually woolly. *Calyx-teeth* minute. *Petals* usually 6-7, lanceolate, woolly outside. *Stamens* 20-30. *Berry* ⅓ in. long, ellipsoid, pubescent, finally glabrous, black, filled with red pulp, endocarp bony.

Common within the area, except in Dehra Dun, where Kanjilal says it has not been found. DISTRIB. Throughout the greater part of India, extending to Ceylon, Burma, the Malay Penins. and Islands, S. China, the Philippines, and E. Africa. Flowers Feb. to April. The aromatic root-bark is medicinal, and the hard brown heart-wood is used for oil-mills and other purposes.

2. MARLEA, Roxb.; Fl. Brit. Ind. ii, 742.

Trees or shrubs. *Leaves* alternate, petioled, orbicular or oblong from an oblique base. *Flowers* in axillary contracted cymes, white, jointed on the pedicel, hermaphrodite. *Calyx-tube* adnate to the ovary, limb toothed or truncate. *Petals* 4-8, linear, free or slightly cohering at the base, valvate. *Stamens* 4-8, *filaments* attached to the petals slightly at the base and there usually hairy; *anthers* linear. *Ovary* 1-3-celled or 1-celled at the apex, 2-3-celled at the base, crowned by a disk; *style* long, often thicker upwards and pubescent; *stigma* simple or lobes 4, linear or sub-clavate; *ovule* solitary in each complete or incomplete cell. *Berry* 1-2-celled, 1-2-seeded. *Seed* (in *M. begoniæfolia*) oblong, compressed; *cotyledons* orbicular, thin, leafy.—Species 9, India to Japan, Malaya, Australia, and Polynesia.

M. begoniæfolia, *Roxb. Hort. Beng. 28; Fl. Ind. ii, 261; Brand. For. Fl. 251; F. B. I. ii, 743; Watt E. D.* M. affinis, *Dene in Jacquem. Voy. Bot. t. 83.* Alangium begoniæfolium, *Harms. in Engl. and Prantl. Pflanzenf. Vol. iii, part 8, p. 261.*

A small tree with grey bark, branches horizontal, young parts villous. *Leaves* simple, about 4½ in. long, or sometimes much longer, orbicular to broadly oblong, acuminate, unequally rounded or subcordate at the base, distantly angular or entire, glabrous above, puberulous on the nerves beneath; *petiole* 1-1½ in., glabrous or fulvous-hairy. *Cymes* 1-3 in., dichotomous, 8-12-flowered, more or less fulvous-hairy. *Petals* 6-8, strap-shaped, slightly hairy, white. *Style* hairy, *stigma* 2-4-lobed. *Fruit* ½ in. long, ovoid, obscurely ribbed, glabrous, crowned with the very shallow calyx-limb.

Dehra Dun, in swamps (Kanjilal). DISTRIB. Outer Himalaya, up to 6,000 ft., Bengal, Khasia Hills, Burma; also the Malay Archipel., China, Japan, and in E. and W. Africa. Flowers March to May. The foliage resembles that of a maple. The leaves are collected for sheep-fodder on the Himalaya.

LX.—RUBIACEÆ.

Trees, shrubs or herbs, rarely annuals, erect or twining, with or without spines, rarely truly prickly. *Leaves* simple, opposite or whorled, quite entire, stipulate (except in *Galieæ*). *Inflorescence* various. *Calyx-tube* adnate to the ovary, limb various. *Corolla* usually regular, 4—5-lobed; lobes valvate imbricate or contorted. *Stamens* 4—5, inserted on the mouth or tube of the corolla; *anthers* 2-celled, usually dorsifixed and dehiscing laterally or in front. *Disk* epigynous, usually annular or cushion-shaped. *Ovary* wholly inferior, 2—10-celled; *style* simple or cleft, *stigmas* various; *ovules* 1 or more in each cell. *Fruit* a berry capsule or drupe, or of dehiscent or indehiscent cocci, 2—10 celled. *Seeds* various, endosperm fleshy or horny.—Species about 4,000, chiefly tropical or subtropical.

Ovules usually many in each cell (solitary in *Cephalanthus*)
- Flowers in dense globose heads.
  - Ovaries confluent, fruits forming a globose fleshy mass, cor-lobes imbricate in bud.—A shrub . . . 1. CEPHALANTHUS.
  - Ovaries free or nearly so, capsules free, cor-lobes imbricate or valvate.—Trees.
    - Flowers bracteolate.
      - Calyx-limb 5-lobed, stigma clavate 2. ADINA.
      - Calyx-limb entire, stigma mitriform . . . . . 3. MITRAGYNA.
    - Flowers without bracteoles.—A climbing shrub with hooked peduncles . 4. UNCARIA.
- Flowers not in globose heads.
  - Seeds winged.—A tree . . . . 5. HYMENODICTYON.
  - Seeds not winged.
    - Cor-lobes valvate in bud.—Herbs.
      - Cor-lobes toothed, fruit indehiscent 6. DENTELLA.
      - Cor-lobes entire, fruit usually a 2-celled capsule.
        - Anthers opening by apical pores . 7. ARGOSTEMMA.
        - Anthers opening laterally.
          - Flowers usually 4-merous
            - Cal-teeth contiguous on the capsule . . . . 8. HEDYOTIS.

Cal-teeth remote on the capsule.
Seeds angular or globose . 9. OLDENLANDIA.
Seeds plano-convex, deeply reticulate . . . 10. ANOTIS.
Flowers 5-merous . . . 11. OPHIORRHIZA.
Cor-lobes twisted in bud.—Trees or shrubs.
Fruit a 2-celled capsule . . 12. WENDLANDIA.
Fruit fleshy, indehiscent.
Flowers rather large, usually solitary.
Ovary 2-celled, placentas on the septa . . . . 13. RANDIA.
Ovary 1-celled, placentas parietal . . . . 14. GARDENIA.
Flowers small, in sessile axillary fascicles . . . . 15. HYPTIANTHERA.
Ovules solitary in each cell.
Cor-lobes twisted in bud.—Trees or shrubs with fragrant flowers.
Flowers in 3—chotomous corymbs.
Leaves coriaceous; style bifid, shortly exserted . . . . . 16. IXORA.
Leaves membranous; style long-exserted, simple . . . . 17. PAVETTA.
Flowers in axillary fascicles or solitary . 18. COFFEA.
Cor-lobes valvate in bud.
Leaves not whorled, stipulate.
Fruit a capsule, 5-valved at the apex.—A shrub . . . . . 19. HAMILTONIA.
Fruit indehiscent, formed of the succulent enlarged calyces enclosing many 1-seeded pyrenes.—A tree . 20. MORINDA.
Fruit dry, dehiscing septicidally.—Herbs.
Fruit of 2 indehiscent carpels . 21. KNOXIA.
Fruit of 2 separable mericarps, one or both dehiscing ventrally . . 22. SPERMACOCE.

Leaves whorled, stipules 0.—Herbs.

Cor-lobes 5	23. RUBIA.
Cor-lobes 4	24. ?ALIUM.

1. CEPHALANTHUS. Linn.; Fl. Brit. Ind. iii, 23.

Shrubs or small trees. *Leaves* opposite or whorled ; stipules short. *Flowers* densely crowded in terminal or axillary solitary simple or panicled globose heads mixed with setaceous or paleaceous bracteoles ; peduncles with stipular caducous bracts about the middle. *Calyx-tube* obpyramidal ; limb cup-shaped, 4—5-toothed or -lobed. *Corolla-tube* long, funnel-shaped; throat glabrous or hairy ; lobes 4, imbricate. *Stamens* on the mouth of the corolla ; *filaments* short ; *anthers* 2-cuspidate at the base. *Ovary* 2-celled, *style* filiform, *stigma* capitate or clubbed ; *ovules* one in each cell, pendulous. *Fruit* of numerous obpyramidal indehiscent 1-seeded cocci. *Seeds* pendulous, with a fungoid aril ; endosperm horny.—Species 6, in Trop. Asia, Africa, and America.

C. occidentalis, *Linn. Sp. Pl. 95 ; Havil. in Journ. Linn. Soc. xxxiii 38.* C. naucleoides, *DC.; F. B. I. iii, 24 ; Gamble Man. Ind. Timb. 401.* Nauclea tetrandra, *Roxb.; Fl. Ind. i, 516.*—*Vern. Jál kemba* (N. Oudh).

An evergreen shrub or small tree 6-20 feet. Branches and leaves opposite or ternately verticillate, glabrous or somewhat pubescent. *Leaves* petioled, 3-6 in. long and 1-2 in. broad, ovate or ovate-lanceolate, acuminate or acute, entire, rounded or narrowed at the base; nerves prominent ; *stipules* acuminate. *Peduncles* 1-3 in. long, simple or branched, terminal or in the axils of the upper leaves ; *bracts* small. *Heads* globose, about ¾-1 in. in diam., receptacle pubescent. *Flowers* sessile, white ; bracteoles clavate. *Calyx-tube* produced beyond the ovary ; lobes short, ovate, with interposed black glands. *Corolla-tube* up to ½ in. long, glabrous; lobes 4—5, with a black gland between each at the base. *Style* slender, about twice as long as the corolla.

Sub-Himalayan tracts in Pilibhit and in the Kheri district of N. Oudh (Duthie's collector Nos. 22377, 25903, 22381), growing in swampy ground. Flowers in May. DISTRIB. E. Bengal, Sikkim, Assam, and Upper Burma ; also in China, N. America, the W. Indies, and Brazil. It is known as "*Swet Kadam*" in Bengal and "*Pani Kadam*" in Assam ; and in N. America it bears the name of "Button-bush". Watt (in Agri. Ledger No. 6 of 1902, p. 154) says that in Assam and Manipur the pith is used like that of the *sola* plant (*Æschynomene aspera*) in the manufacture of artificial flowers. The Pilibhit and N. Oudh specimens are quite glabrous.

2. ADINA, Salisb.; Fl. Brit. Ind. iii, 24.

Trees or shrubs. *Leaves* petioled; stipules large, caducous. *Flowers* bracteate or not, densely crowded in solitary or panicled globose heads; receptacle hairy. *Calyx-tube* angled, lobes 5. *Corolla* funnel-shaped, tube long, throat glabrous; lobes 5, valvate. *Stamens* 5, on the mouth of the corolla, *filaments* short. *Ovary* 2-celled; *style* filiform, *stigma* capitate or clubbed; *ovules* numerous, imbricated on a pendulous placenta in each cell. *Capsule* of 2 dehiscent cocci, many-seeded. *Seeds* oblong, testa winged, endosperm copious. —Species 6 or 7, in Trop. Asia and Africa.

A. cordifolia, *Hook. f. in Gen. Pl. ii, 30; Brand. For. Fl. 263, t. 33; F. B. I. iii, 24; Watt E. D.; Havil. in Journ. Linn. Soc. xxxiii, 47; Gamble Man. Ind. Timb. 401; Kanjilal For. Fl. School Circle, N.-W. P. 100; Cooke Fl. Bomb. i, 581.* Nauclea cordifolia, *Willd.; Roxb.; Fl. Ind. i. 514; W. & A. Prod., 391. Fl. 118.*—Vern. *Haldu, hardu, tikhoe* (Oudh).

A large tree, its trunk usually buttressed at the base. Branchlets leaves beneath and petioles pubescent. *Leaves* petioled, deciduous, 4-9 in. in diam., orbicular, cordate, abruptly acuminate, pubescent beneath, coriaceous; lateral nerves 5-7 pair, prominent beneath; *petiole* stout, about half the length of the leaf; *stipules* orbicular or oblong, pubescent, caducous. *Peduncles* 1-3, axillary, 1-2 in. long, stout, 1-rarely 2-headed, as long as the petioles, with 2 small bracts near the apex. *Heads* globose, ¾-1 in. in diameter, *receptacle* pilose; *bracteoles* short, linear. *Flowers* many, yellow. *Calyx-lobes* clavate. *Corolla* dilated above, downy outside, lobes recurved. *Styles* exserted, *stigma* clavate. *Capsule* ½ in. cuneate, downy; cells about 6-seeded.

Forests of Dehra Dun and of the Siwalik range, and throughout the Sub-Himalayan tracts of Rohilkhand. N. Oudh and Gorakhpur, also in Bundelkhand. Leafless for a short time in May. Flowers in June and July. DISTRIB. Outer ranges of Himalaya up to 3,000 ft., extending eastwards to Sikkim, Bhutan, and Burma, and southwards through Cent. and S. India to Ceylon. A handsome shade-giving tree. The hard reddish brown wood is much prized by native wood-carvers; it is also largely used for making furniture and agricultural implements.

3. MITRAGYNA, Korth.

STEPHEGYNE IN FL. BRIT. IND. III, 25.

Shrubs or trees. *Leaves* petioled; stipules large, caducous. *Flowers* crowded in globose axillary and terminal solitary panicled or subumbelled heads united by their confluent calyx-tubes, each peduncle with 2 deformed leaves at the top, within which are 2 caducous bracts; bracteoles paleaceous. *Calyx-tube* short, limb

cupular or tubular, truncate or 5-toothed. *Corolla* funnel-shaped, tube long, throat hairy or glabrous, lobes 5, short, valvate. *Stamens* 5, on the throat of the corolla, *filaments* short. *Ovary* 2-celled; *style* filiform, *stigma* capitate or mitriform; *ovules* imbricated upwards on pendulous placentas. *Fruit* of 2 dehiscent cocci, many-seeded. *Seeds* small, testa winged, endosperm fleshy.—Species 10, in Trop. Asia and Africa.

M. parvifolia, *Korth. Obs. Naucl. Ind. 19; Havil. in Journ. Linn. Soc. xxxiii, 69; Cooke Fl. Bomb. i, 581.* Stephegyne parvifolia, *Korth.; Brand. For. Fl. 262; F. B. I. iii, 25; Watt E. D.; Gamble Man. Ind. Timb. 403; Kanjilal For. Fl. School Circle, N.-W. P., 201; Collett Fl. Siml. 227.* Nauclea parvifolia, *Willd.; Roxb.; Fl. Ind. i, 513; W. & A. Prod. 391; Royle Ill. 238.* Nauclea parviflora (misprint for *parvifolia*) *Pers.*—Vern. *Kaem, kangei* (Bijnor), *Khem* (Bundelkhand).

A large tree, often with buttresses at the base of the trunk. *Leaves* variable as to size and shape, deciduous, 2-6 in. long, orbicular oval or obovate, rounded at the apex or bluntly acuminate, cuneate rounded or sub-cordate at the base, glabrous or pubescent, coriaceous; lateral nerves 6-8 pair; *petioles* short; *stipules* large, obovate, membranous, pale and often pink-coloured, caducous. *Peduncles* ½-3 in. long, simple or in 3-headed panicles supported by a pair of bract-like leaves, narrowed into slender petioles. *Heads* 1 in. in diam., many-flowered, light-yellow or almost white; *bracteoles* minute, spathulate, caducous. *Calyx-limb* very short, truncate or minutely 5-toothed. *Corolla* funnel-shaped, glabrous; lobes 5, shorter than the narrow tube, recurved. *Stamens* inserted within the mouth of the tube. *Styles* much exserted, *stigma* mitriform. *Capsule* ½ in. long. *Seeds* minute, numerous, winged.

Forests of Dehra Dun and of the Siwalik range and throughout the Sub-Himalayan tract, also in Bundelkhand and Merwara. Flowers from May to July; and the fruit, which ripens during the cold season, remains for a long time on the tree. DISTRIB. Dry forests from the Chenab to Burma; Central and South India; Ceylon.

The wood is hard and of a pinkish-brown colour, and is used for the same purposes as that of *haldu*. The bark yields a coarse fibre, and the leaves are used as fodder.

4. UNCARIA, Schreb.; Fl. Brit. Ind. iii, 28.

Climbing shrubs. *Leaves* shortly petioled, stipules entire or 2-fid. *Flowers* in globose axillary peduncled solitary or panicled ebracteolate heads; peduncles often headless and converted into hooked tendrils. *Calyx-tube* spindle-shaped; limb 5-lobed or -parted. *Corolla-tube* long, funnel-shaped; limb 5-lobed, valvate; throat glabrous. *Stamens* 5, on the throat of the corolla, *filaments* short,

anthers with 2 basal bristles. *Ovary* 2-celled, *style* slender, *stigma* capitate; *ovules* many, ascending on the placentas. *Capsule* elongate, septicidally 2-valved, many-seeded. *Seeds* imbricating upwards, testa winged above and below; embryo clavate, in fleshy endosperm.—Species 30, all in Trop. Asia, except one African and one in America.

U. pilosa. *Roxb. Hort. Beng. 86; Fl. Ind. i, 520; F. B. I. iii, 32; Havil. in Journ. Linn. Soc. xxviii, 88; Gamble Man. Ind. Timb. 405.*

A large scandent shrub. Branches peduncles and under surface of leaves tomentose. *Leaves* shortly petioled, 4-6 in. long by 2-2½ in. wide, oblong-ovate, abruptly caudate-acuminate, rounded at the base, sub-membranous and green when dry, pilose or scaberulous above, pubescent beneath; main lateral nerves 8-10 pair, veins distinct; *stipules* 2-partite, the segments lanceolate and recurved. *Peduncles* all axillary, 1-3 in. long, very stout, tapering from the base and with a whorl of linear-lanceolate bracts above the middle; the sterile peduncles transformed into stout hooked tendrils. *Heads* 1½ in. in diam. *Calyx-lobes* linear-obtuse, equalling the tube, often clavate. *Corolla-tube* very slender, very hairy. *Capsules* sessile, ½ in., clavate, glabrous, tipped by the long calyx-tube.

Dehra Dun, in shady ravines (Duthie). DISTRIB. Trop. Himalaya from Garhwal eastward to Sikkim, the Khasia Hills and Burma.

5. **HYMENODICTYON.** Wall.; Fl. Brit. Ind. iii, 35.

Trees or shrubs with thick branches and bitter bark. *Leaves* petioled, deciduous; stipules deciduous. *Flowers* small, spicate; spikes in axillary and terminal nodding panicles with 1 or 2 large leafy reticulate persistent bracts. *Calyx-tube* short, lobes 5-6, ovate or subulate, deciduous. *Corolla* funnel- or bell-shaped, glabrous within; lobes 5, short, valvate in bud with everted margins. *Stamens* 5, inserted below the throat; *filaments* short, dilated upwards; *anthers* linear. *Ovary* 2-celled, *style* filiform, *stigma* spindle-shaped, *ovules* numerous, on cylindric placentas adnate to the septum. *Capsule* loculicidally 2-valved, many-seeded, placentas at length free. *Seeds* imbricating upwards, testa broadly winged, embryo small in fleshy endosperm.—Species 4-5, in Trop. Asia and Africa.

H. excelsum, *Wall. in Roxb. Fl. Ind. (ed. Carey & Wall.) ii, 149; W. & A. Prod. 392; Royle Ill. 239; Brand. For. Fl. 267; F. B. I. iii, 35; Watt E. D.; Kanjilal For. Fl. Sch. Circ., N.-W. P., 201; Gamble Man. Ind. Timb. 406; Collett Fl. Siml. 227; Cooke Fl. Bomb. i, 582.*

Cinchona excelsa, *Roxb. Fl. Ind. i, 529.* C. thyrsiflora, *Roxb. Fl. Ind. i, 530.*—Vern. *Bhaulan, kukurkát, lamkana* (Merwara).

A large deciduous tree. Bark of trunk furrowed and rough, that of branches smooth. *Leaves* 4-10 in. long by 3-5 in. wide, ovate-elliptic or sub-orbicular, obtuse or abruptly acuminate, narrowed into a petiole 1-3 in., membranous, finely pubescent on both surfaces; lateral nerves 7-10 pair; *stipules* oblong, broad-based, recurved, usually glandular-serrate, caducous. *Floral leaves* 3-5 in. long, on long petioles, strongly nerved. *Flowers* many, on the spicate branches of large often drooping pubescent bracteate panicles, small, white or greenish, fragrant; *pedicels* short; *bracts* large, persistent. *Calyx* $\frac{1}{12}$ in., pubescent. *Corolla* $\frac{1}{4}$ in., hairy outside, broadly campanulate, with short acute lobes. *Styles* exserted. *Capsules* on thick decurved pedicels, $\frac{3}{4}$ in. long, ellipsoid. *Seeds* small, many.

Dehra Dun and Siwalik range, chiefly in *sal* forests, and in the Sub-Himalayan tracts east to Gorakhpur; also in Merwara. Flowers during June and July. DISTRIB. Along the base of the Punjab Himalaya west to the Ravi ascending to 5,000 ft. and from Nepal eastward to Chittagong and Burma, and southward to Central and S. India; also in Java. The wood, which is very light and soft, is utilized for the manufacture of toys, scabbards and other small articles. The bark is used as a febrifuge as well as for tanning, and the leaves afford fodder for cattle.

6. DENTELLA, Forst.; Fl. Brit. Ind. iii, 42.

A small weak prostrate annual or perennial-rooted herb. *Leaves* small; stipules connate, scarious. *Flowers* minute, solitary axillary and in the forks of the branches, sessile or pedicelled, white. *Calyx-tube* globose; limb tubular, persistent. *Corolla* funnel-shaped, hairy within; lobes five, 2-3-toothed, induplicate-valvate. *Stamens* 5, in the middle of the corolla-tube, *filaments* short, *anthers* linear., *Ovary* 2-celled, *style* short, *stigma* filiform; *ovules* numerous, on hemispheric placentas. *Fruit* small, dry, globose, 2-celled, indehiscent, many-seeded. *Seeds* minute, angled, testa dotted.—A single species.

D. repens, *Forst. Char. Gen. 26, t. 13; Roxb. Fl. Ind. i, 532; W. & A. Prod. 405; F. B. I. iii, 42; Cooke Fl. Bomb. i, 585.*

A straggling weed, the stems usually rooting at the joints. *Leaves* sub-sessile, about $\frac{1}{4}$ in. long, obovate spathulate or elliptic, 1-nerved, ciliate or glabrous; *stipules* truncate. *Flowers* $\frac{1}{12}$ in. long. *Calyx-teeth* acute or acuminate. *Corolla-lobes* ovate, acute, with a tooth on each side. *Filaments* very short. *Style* cleft nearly to the base. *Capsule* $\frac{1}{10}$ in. in diam., often hispid or villous, crowned by the persistent calyx limb.

Agra district (Munro). This is the only record I have seen of its occurrence within the area of this flora. Owing to its insignificant appearance it has no doubt been frequently overlooked in other parts of the area. DISTRIB. In moist places throughout Bengal, also eastward to Burma and south to Ceylon, extending to the Malay Peninsula and Islands, China, N. Australia, Polynesia and C. America.

7. ARGOSTEMMA. Wall.; Fl. Brit. Ind. iii, 42.

Small delicate herbs. *Leaves* usually membranous, opposite or falsely whorled, very unequal; stipules entire, persistent or obsolete. *Flowers* white, in peduncled cymes or umbels. *Calyx-tube* short; lobes 5, rarely 3-7. *Corolla* rotate, 4-5-partite, valvate. *Stamens* 4-5, *filaments* short; *anthers* large, free, conniving or cohering, erect or declinate, dehiscing by 1-2 terminal pores, rarely longitudinally. *Ovary* 2-celled, *style* filiform, *stigma* capitellate; *ovules* very many, on projecting placentas. *Capsule* coriaceous or membranous, 2-celled, dehiscing at the apex or by an operculum. *Seeds* minute, angled or compressed, testa granulate or reticulate; embryo most minute, in dense fleshy endosperm.—Species about 40, all from subtropical Asia and Malaya, except one in Africa, which is also Indian.

A. sarmentosa, *Wall. in Roxb. Fl. Ind. (ed. Carey and Wall.) ii, 324; F. B. I. iii, 42; Collett Fl. Siml. 229.*

Stems 2-4 in. high, often with long filiform simple or branched runners from buds below the leaves. *Leaves* 1-4 in. long, sessile, opposite or in whorls of four, more or less unequal or dissimilar, orbicular elliptic or broadly obovate, obtuse or sub-acute, sparingly pubescent, dark green above. *Flowers* terminal, solitary or in umbels, 4-merous, ⅔ in. across, white with a green eye; *pedicels* stout, ¼-½ in. long; *bracts* ovate. *Calyx* pubescent; teeth ovate, obtuse. *Corolla-lobes* acuminate. *Anthers* 4, free, slender, opening by pores.

Dehra Dun, in shady ravines. Flowers during the rainy season. DISTRIB. From Garhwal to Bhutan at elevations between 2,000 and 3,000 ft.

8. HEDYOTIS. Linn.; Fl. Brit. Ind. iii, 49.

Herbs, undershrubs or shrubs. *Leaves* very rarely ternately whorled; stipules free or combined in a bristly sheath. *Flowers* white or lilac, in terminal or axillary open close or capitate cymes. *Calyx-lobes* 4, acute, persistent, without interposed teeth. *Corolla* funnel- or bell-shaped; lobes 4, ovate, or linear, valvate in bud. *Stamens* 4, in the tube or throat of the corolla. *Ovary* 2-celled,

style filiform, *stigma* 2-fid or 2-lobed, *ovules* numerous, on sessile or pedicelled placentas, attached to the septum at or below the middle. *Fruit* small, membranous coriaceous or crustaceous, indehiscent or septi- or loculicidal or of 2 separable or connate cocci, 2-many-seeded. *Seeds* plano-convex or angled, testa very rarely winged, embryo clavate in horny endosperm.—Species about 80, chiefly in Trop. Asia.

Leaves narrow-linear; cal-teeth subulate, shorter than the capsule	1. *H. pinifolia.*
Leaves elliptic- or linear-lanceolate; cal-teeth triangular, about equalling the capsule . .	2. *H. hispida.*

1. H. pinifolia. *Wall. Cat. 850; F. B. I. iii, 60.*

A slender diffuse very much branched annual, 4-8 in. high, turning black when dry. *Branches* acutely 4-angled and with the angles sometimes hispid. *Leaves* 1-1½ in. long, often fascicled, narrowly linear, acuminate, rigid, scabrous above, 1-nerved, margins revolute; *stipules* very short, with many rigid bristles. *Cymes* axillary and terminal, sessile, capitate. *Heads* ¼-½ in. in diam., 3-many-flowered. *Calyx-teeth* subulate, shorter than the ovoid hispid capsule.

Bundelkhand (Mrs. Bell). DISTRIB.: Lower Bengal, Burma, Andaman Islands, Malaya and China

2. H. hispida. *Retz. Obs. iv, 23; Roxb. Fl. Ind. i, 364; F. B. I. iii, 60; Collett Fl. Siml. 229.*

A diffuse annual. *Stems* 6-18 in. long, terete below, angled above, scabrid. *Leaves* sessile, 1½-2½ in., elliptic or linear-lanceolate, acute or acuminate, rigid, 1-nerved; margins recurved, hispid; *stipules* ciliate. *Flowers* 2-6, in axillary clusters, small, white. *Calyx-teeth* triangular, about equalling the hispid ovoid capsule.

Dehra Dun (Gamble, Duthie). DISTRIB. Along the base of the Himalaya from Chamba and Kángra to Sikkim, also in Assam; E. Beng., Malaya and China.

9. OLDENLANDIA, Linn.; Fl. Brit. Ind. iii, 64.

Slender erect or diffuse di-trichotomously branched herbs. *Leaves* usually small and narrow; stipules acute or bristly. *Flowers* small, white or pink, in dichotomous axillary and terminal usually panicled cymes, rarely solitary. *Calyx-teeth* 4, rarely 5, usually erect and distant in fruit, with sometimes alternating teeth. *Corolla* rotate funnel- or salver-shaped, tube short or long; lobes 4, rarely 5, obtuse, valvate. *Ovary* 2-celled, *style* filiform; *stigmas* 2, linear, *ovules* numerous, placentas attached to the septum. *Capsule* small, usually

membranous, terete didymous or angled, loculicidal at the top, rarely indehiscent, many-seeded. *Seeds* angled or globose, testa not winged smooth or pitted; embryo clavate, in fleshy endosperm.—Species about 80, tropical and subtropical, chiefly Asiatic.

Seeds angled, smooth.
- Corolla-tube short.
  - Peduncles from the lower or from all the axils, 1-4-flowered.
    - Leaves usually linear, cal-teeth in fruit distant.
      - Glabrous or scabrid, pedicels usually 2-3 flowered . . . . . 1. *O. corymbosa.*
      - Always glabrous, flowers solitary, sessile or nearly so . . . . 2. *O. diffusa.*
    - Leaves elliptic, flat, cal-teeth in fruit contiguous . . . . . 3. *O. crystallina.*
  - Peduncles axillary and in open terminal panicled cymes.
    - Stem sharply angled, capsules broadly didymous . . . . . 4. *O. brachiata.*
    - Stem terete or obscurely 4-angled, pedicels long and very slender, flowers and globose capsules minute . . . 5. *O. dichotoma.*
- Corolla-tube long.
  - Leaves in fascicled whorls, revolute, flowers pale blue . . . . . 6. *O. aspera.*
  - Leaves not in fascicles, flat; flowers brownish . . . . . 7. *O. gracilis.*

Seeds subglobose, coarsely pitted, cor-tube short.
- Leaves all opposite . . . . . 8. *O. paniculata.*
- Upper leaves in whorls of four . . . 9. *O. nudicaulis.*

1. O. corymbosa, *Linn. Sp. Pl. 119; F. B. I. iii, 64; Watt E. D.; Collett Fl. Siml. 230; Cooke Fl. Bomb. i, 588.* O. biflora, *Lamk. (not of Linn.); Roxb. Fl. Ind. i, 423.* O. ramosa, *Roxb. l. c. 424.* Hedyotis Burmanniana, *R. Br.; W. & A. Prod. 415.* H. intermedia, *W. & A. Prod. 415.*—Vern. *Daman-papar.*

A slender herb up to 1 ft. or more high, but often diminutive and straggling. *Leaves* sessile, 1-2 in. long, linear or linear-lanceolate, erect or spreading; margins scabrous and often revolute; *stipules* short, membranous, dentate or bristly. *Peduncles* axillary, solitary, slender,

shorter than the leaves, usually 2-3-flowered; *pedicels* filiform; *bracts.* subulate. *Calyx-teeth* subulate, nearly equalling the tube when in flower. *Corolla* white, its tube short. *Capsule* usually broad, didymous or globose or narrowed to the base, not ribbed, the crown not rising above the base of the calyx-teeth.

An abundant weed throughout the area. DISTRIB. Common all over India from the Punjab southward to Ceylon and eastward to Malaya, China, Java, and the Philippines; on the Himalaya it extends up to 6,000 ft., and is found also in Trop. Africa and America. It is an extremely variable plant, and some of its forms cannot easily be distinguished from *O. diffusa*. A decoction of this plant is much used by native doctors as a remedy for bilious attacks.

2. O. diffusa. *Roxb. Hort. Beng. 11; Fl. Ind. i, 423: F.B.I. iii, 65; Cooke Fl. Bomb. i, 589.*

A glabrous diffuse annual with prostrate stems which often root at the nodes. *Leaves* ¾-1½ in. long, linear, acute, margins usually revolute; *stipules* short, laciniate. *Peduncles* axillary, solitary and usually 1-flowered. *Flowers* sessile or nearly so. *Calyx-teeth* subulate, rather shorter than the corolla-tube, not contiguous when in fruit. *Corolla* white. *Capsule* subglobose, smooth, its crown low.

A very common weed throughout the area. DISTRIB. Abundant all over India, also in Ceylon and Malaya, extending to the Malay Islands, the Philippines, China and Japan.

3. O. crystallina, *Roxb. Hort. Beng. 11; Fl. Ind. i, 422; F. B. I. iii, 65; Cooke Fl. Bomb. i, 589; Collett Fl. Siml. 230.* Hedyotis pumila, *Linn f.; W. & A. Prod. 414.*

A glabrous or slightly hispid annual with many diffuse flaccid leafy branches. *Leaves* subsessile, ½-¾ in. long, ovate or elliptic-lanceolate, sub-acute, flat; *stipules* bristly. *Peduncles* solitary, usually 1-2-flowered, filiform, shorter than or equalling the leaves. *Calyx-teeth* large, triangular-lanceolate, their bases touching in fruit. *Corolla* white, not much exceeding the calyx, its tube short. *Capsule* obovoid, laterally compressed, glabrous, ribbed, the crown depressed.

Bundelkhand (Mrs. Bell). DISTRIB.: Punjab plain below Jamu, and on the W. Himalaya near Simla and in Garhwal. Elsewhere it occurs in E. Bengal and in the Deccan, and extends to Java. Cystoliths abound in the tissues of this plant, as in some forms of *O. corymbosa*.

4. O. brachiata, *Hook. f. in F. B. I. iii, 66.* Hedyotis brachiata *Wight; W. & A. Prod. 415.*

A slender glabrous annual. *Stem* erect, acutely 4-angled. *Leaves* narrowly linear. *Peduncles* solitary, axillary, 1-flowered and in open dichotomous terminal cymes. *Calyx-teeth* subulate, rather shorter than corolla-tube. *Capsule* small, broadly didymous, its crown low.

Siwalik range (Gamble), Moradabad (T. Thomson). DISTRIB.: Behar and southwards to Madras. Very similar to some forms of *O. corymbosa*, but the inflorescene is different.

5. O. dichotoma, *Hook. f. in F. B. I. iii, 67; Cooke Fl. Bomb. i, 590* Hedyotis dichotoma, *Wall.* (in part); *W. & A. Prod. 416* (in part).

A slender annual, glabrous or sparsely hairy. *Stems* erect, up to 18 in. high, simple or much branched, terete, shining and usually glabrous; branches spreading, nodes distant. *Leaves* 1-3 in. long, linear-lanceolate, acute, flat, upper surface subscaberulous. *Peduncles* axillary and in open terminal panicles, capillary. *Flowers* very minute, on long hair-like pedicels, rarely solitary, white. *Calyx-teeth* subulate, much shorter than the slender corolla-tube, distant in fruit. *Capsule* very small, globose, crown not produced, cells about 6-seeded.

Agra district (Munro), Bundelkhand (Mrs. Bell). DISTRIB. Kumaon at 5,000 ft. (Duthie), and from Bombay and the Central Provinces to S. India.

6. O. aspera, *DC. Prod. iv, 428; F. B. I. iii, 68; Cooke Fl. Bomb. i 591.* Hedyotis aspera, *Heyne; W. & A. Prod. 417.*

A stout annual, 6-12 in. high. *Stem* scabrid. *Leaves* in fascicled whorls, subsessile, erect, 1-3 in. long, narrowly linear, acute, glabrous above, coriaceous, margins revolute; *stipules* membranous, with 1-3 terminal bristles. *Flowers* solitary or in pairs, on the branches of 3-chotomous cymes, sessile or nearly so, ¼ in. long, pale blue. *Calyx-teeth* much shorter than the corolla-tube, subulate, distant in fruit. *Corolla* funnel-shaped, its tube ⅛ in. long, slender. *Capsules* ¼ in. in diam., globose or sub-didymous, scabrid.

Rohilkhand, and in the Bahraich district of N. Oudh (Duthie), Agra district (Munro). DISTRIB. Punjab and from Bombay and Cent. Provinces to S. India; also in Trop. Africa.

7. O. gracilis, *Hook. f, in F. B. I. iii, 68; Cooke Fl. Bomb. i, 591.* Hedyotis gracilis, *Wall. in Roxb. Fl. Ind. (ed. Carey & Wall.) i, 371.*

A slender erect herb 6-12 in. high. *Stem* sparingly branched, scaberulous or glabrate below; branches erect, glabrous. *Leaves* erect, not in fascicles, 2-3½ in. long, narrowly linear, acuminate, flat, glabrous, nerves indistinct; *stipules* truncate. *Cyme-branches* slender, spreading in flower, erect in fruit; *pedicels* very slender. *Calyx* ⅛ in. long, glabrous; lobes long, acute. *Corolla* ¼ in., brown; tube very slender; lobes linear, obtuse. *Capsule* pedicelled, obovoid globose or hemispheric, the apex slightly protruding.

Sub-Himalayan tract from Pilibhit and N. Oudh to Gorakhpur (Duthie). DISTRIB. N. Bengal; Trop. Himalaya, up to 5,000 ft., from Jaunsar to Sikkim; Bombay, Cent. and S. India; also in Burma.

8. O. paniculata, *Linn. Sp. Pl. 1667; F. B. I. iii, 69.* O. alata, *Roxb. Fl. Ind. i, 421 (not of Kœn.).* Hedyotis racemosa, *W. & A. Prod. 414.*

A succulent glabrous annual, 6-18 in. high, branched from the base. *Stem* erect or diffuse, the lower branches often stout and obtusely 4-angled. *Leaves* ½-3 in. long, elliptic-ovate or oblong, subacute, flat, narrowed into a short or long petiole, bright green; nerves indistinct; *stipules* truncate, bristly. *Cymes* short, from the upper leaf-axils, 3-8-fid, panicled. *Flowers* minute, white. *Calyx-tube* not produced above the ovary. *Capsules* ⅛-¼ in. in diam., on slender pedicels, turbinate didymous or hemispheric, occasionally 4-ribbed, membranous, the crown usually exceeding the calyx-teeth.

Sub-Himalayan tract in N. Oudh and Gorakhpur (Duthie). DISTRIB. Sikkim, Assam, E. Beng., S. India, Ceylon; also in Burma, Malaya, Philippines, China, and Polynesia.

9. O. nudicaulis, *Roth. Nov. Sp. 95; F. B. I. iii, 70.* Hedyotis nudicaulis, *W. & A. Prod. 416.*

A small erect somewhat hairy annual. *Stem* short, naked or with 2 leaves below, simple or 3-chotomously forked, each branch usually bearing 4 unequal leaves in a whorl. *Leaves* shortly petioled, ½-2 in. long, ovate or elliptic, obtuse; nerves distinct. *Flowers* at the ends of capillary branches of the long-peduncled terminal cymes, very small. *Calyx-teeth* minute, subulate, obscure in fruit. *Capsules* hemispheric.

Dehra Dun (Gamble, Duthie); Siwalik range (J. L. Stewart). DISTRIB. Tropical Himalaya from Garhwal eastwards; Chota Nagpur (on Parasnath), S. India, Burma, Andaman Islands, Malay Penins., and Java. This species very much resembles *Mollugo nudicaulis* in habit and general appearance.

10. ANOTIS, D C.; Fl. Brit. Ind. iii, 71.

Herbs, prostrate or ascending, rarely erect; stipules usually membranous or with marginal bristles. *Calyx-tube* short; lobes 4, with broad intervening sinuses. *Corolla* tubular or funnel-shaped; lobes 4, usually shorter than the tube, valvate in bud. *Stamens* 4, on the mouth of the corolla; *anthers* included or exserted. *Ovary* 2-rarely 3-4-celled; *style* filiform; *stigmas* 2-4, linear; *ovules* usually few, rarely solitary in each cell; *placentas* ascending from near the base of the septum. *Capsule* didymous or laterally compressed, crown produced between the calyx-lobes, loculicidally 2-valved at the top, rarely indehiscent, cells 1- or more-seeded. *Seeds* peltate or boat-shaped or rarely plano-convex, coarsely pitted or reticulate. – Species about 25; in Trop. Asia and Australia, and one in S. America.

A. calycina, *Hook. f. in F. B. I. iii, 73; Collett Fl. Siml. 230.*

A slender erect sub-glabrous annual. *Stems* 4-8 in. high, simple or much branched from the base, 4-angled shining. *Leaves* ½-1 in. long, ovate-

lanceolate, acute or acuminate, membranous, sparsely strigose on both surfaces, the margins ciliolate; *stipules* bristly. *Cymes* axillary and terminal, few-flowered, *pedicels* capillary. *Capsules* sessile and pedicelled, broad, didymous, truncate, the crown tumid, often exceeding the minute distant calyx-teeth. *Seeds* many, plano-convex, with a ventral cavity, deeply reticulate.

Dehra Dun (King). Flowers during the rainy season. DISTRIB. Temp., Himalaya from Kashmir to Bhutan between 3,000 and 7,000 ft., also on Mt. Abu and on Parasnath in Chota Nagpur.

11. OPHIORRHIZA, Linn. Fl. Brit. Ind. iii, 77.

Erect creeping or decumbent herbs, rarely under-shrubs. *Leaves* usually elliptic-lanceolate; stipules caducous. *Flowers* white pink or greenish, secund on the branches of axillary or terminal dichotomous cymes. Bracts or bracteoles various or 0. *Calyx-tube* short; lobes 5, small, persistent. *Corolla* tubular or funnel-shaped; lobes 5, short, valvate in bud, often winged on the back, or with a fold in each sinus. *Stamens* 5, inserted on the tube, *anthers* linear. Disk very large, 2-lobed. *Ovary* 2-celled; *style* filiform, *stigmas* broad or linear; *ovules* many, inserted on basal ascending placentas. *Capsules* coriaceous, compressed, obcordate, girt in the middle by the calyx-tube, the crown dehiscing by 2 broad gaping valves; *placentas* divaricating, many-seeded. *Seeds* minute, angled.—Species about 50, mostly in Trop. Asia, a few Australian and Polynesian.

O. fasciculata. *Don. Prod. Fl. Nep. 136; F. B. I. iii, 83.*

Stem erect, 6-18 in. high, simple or branched from a woody base, pubescent above. *Leaves* 1½-5 in. long, elliptic-ovate or lanceolate, pubescent on the nerves beneath, membranous; petioles slender, pubescent; *stipules* lanceolate, acuminate, dilated at the base. *Cymes* ½-¾ in. in diam., axillary and terminal, spreading; *bracteoles* many, lanceolate, pubescent, persistent. *Calyx-tube* compressed; teeth very short. *Corolla* ½-¾ in. long, white, pubescent; tube slender; lobes small, oblong. *Capsule* pubescent.

Dehra Dun (Duthie). Flowers during the rains. DISTRIB. Sub-tropical Himalaya up to 5,000 ft. from Garhwal eastwards; Assam, Manipur and in the Malay Peninsula.

12. WENDLANDIA, Bartl.; Fl. Brit. Ind. iii, 37.

Shrubs or small trees. *Leaves* opposite or ternately whorled; stipules entire or 2-fid. *Flowers* small, rosy or white, in terminal dense thyrsoid or panicled cymes, 2-3 bracteolate. *Calyx-lobes* 4-5,

subequal, small, persistent. *Corolla* tubular salver- or funnel-shaped, throat glabrous or hairy, lobes 4-5, imbricate in bud. *Stamens* 4-5, between the corolla-lobes, *filaments* 0 or elongate, *anthers* versatile, exserted. *Ovary* 2-(rarely 3-) celled; *style* filiform, *stigma* entire 2-fid. or 2-partite; *ovules* numerous, on small globose placentas adnate to the septum. *Capsule* small, globose, loculicidally, (rarely septicidally), 2-valved, many-seeded. *Seeds* very minute, horizontal, compressed; testa membranous, obscurely winged; embryo short, cylindric, in fleshy albumen. Species about 16, in Trop. Asia.

Grey-tomentose, stipules recurved . .	1. *W. exserta.*
Nearly glabrous, stipules erect . .	2. *W. tinctoria.*

1 W. exserta, *DC. Prod. iv, 411; W. & A. Prod. 402; Royle Ill. 238; Brand. For. Fl. 268; F. B. I. iii, 37; Watt E.D.; Kanjilal For. Fl. Sch. Circ. N-W. P. 203; Gamble Man. Ind. Timb. 408; Collett Fl. Siml. 228; Cooke Fl. Bomb. i, 584.* Rondeletia exserta *Roxb.; Fl. Ind. i, 523.* Vern. *Bathna, chaulai* (Saharanpur); *birsa tilka & tilki* (Oudh).

A small deciduous rather crooked tree with rough brown bark. *Branches* terete; young branches, leaves, and inflorescence grey-tomentose. *Leaves* 4-9 in. long by 1-3½ in. wide, opposite, ovate-lanceolate, acute or acuminate, entire, coriaceous, glabrate above, densely pubescent beneath; lateral nerves 12-20 pair; petiole ½-1 in. long; *stipules* ovate, acute, recurved, persistent. *Flowers* subsessile, ¼ in. across, white, fragrant, arranged in sessile pyramidal panicles which exceed the leaves. *Calyx* hairy, the lobes ovate or subulate; persistent. *Corolla tube* shorter than the sub-acute reflexed lobes. *Stamens* exserted. *Style* 2-partite. *Capsules* ⅓ in., globose, white-tomentose. *Seeds* small, black, rugose.

Abundant on the Siwalik range, and especially on landslips; also along the base of the Himalaya eastward to Gorakhpur. Flowers during March and April. DISTRIB. Trop. Himalaya westward to the Chenab and eastward to Sikkim, and from Bengal to Cent. and S. India. A quick-growing ornamental tree. The close-grained tough wood is valued for building purposes and for agricultural implements. The leaves are used as fodder.

2. W. tinctoria, *D.C. Prod. iv, 411; Brand. For. Fl. 269; F. B. I. iii, 38; Watt E.D. Gamb. Man. Ind. Timb. 409.* Rondeletia tinctoria *Roxb. Fl. Ind. i, 522.*

A small tree. *Leaves* opposite or ternate, 4-8 in. long and 2-4 in. wide, elliptic ovate or obovate, acuminate, narrowed into the petiole, glabrous and often shining above, paler and usually pubescent on the nerves beneath or tomentose all over; main lateral nerves 10-12 pair, prominent; petiole ½-¾ in.; *stipules* large, variable in length, always with erect points or with a laterally flattened rigid appendage. *Panicles* large, spreading, pubescent pilose or tomentose. *Flowers* sessile fascicled, ¼ in. long, white. *Calyx-teeth* ovate. *Corolla-tube*

usually slender; lobes ovate, spreading. *Anthers* shortly exserted, on very short filaments. *Stigmas* oblong.

N. Oudh (R. Thompson, and Duthie). Flowers Jan. to March. DISTRIB. Trop. Himalaya from Garhwal eastward to the Khasia Hills, and from Bengal south to the Godaveri; also in Burma. In Bengal and Assam the bark is used as a mordant in dyeing.

13. RANDIA, Linn.; Fl. Brit. Ind. iii, 109.

Shrubs or trees, unarmed or spinous. *Leaves* opposite or with one often arrested, stipules short, intrapetiolar, free or connate. *Flowers* in axillary or leaf-opposed cymes, or solitary fascicled or corymbose, rarely terminal, white or yellowish. *Calyx-tube* various, limb often tubular; lobes variable. *Corolla* funnel- salver- or bell-shaped, tube long or short, throat glabrous or hairy; lobes 5, twisted in bud. *Stamens* 5; anthers subsessile, narrow. *Disk* annular or cushion-shaped. *Ovary* 2-rarely 3-4-celled, *style* short or slender, *stigma* usually fusiform, sunk in placentas attached to the septum. *Berries* globose, ellipsoid or ovoid, 2-celled. *Seeds* few or many, often immersed in pulp, angled, testa thin, albumen horny, cotyledons orbicular.—Species about 100, all tropical.

Spines at the ends of the branchlets, corolla glabrous outside	1. *R. uliginosa.*
Spines axillary, corolla hairy outside.	
Flowers solitary; berry 1½ in. long, yellow .	2. *R. dumetorum.*
Flowers in fascicles; berries small, purple .	3. *R. fasciculata.*

1. R. uliginosa, *DC. Prod. iv, 386; W. & A. Prod. 398; Royle Ill. 238; Brand. For. Fl. 273; F. B. I. iii, 110; Watt E.D.; Kanjilal For. Fl. Sch. Circ. 204; Gamble Man. Ind. Timb. 412; Cooke Fl. Bomb. i, 599.* Posoqueria uliginosa, *Roxb. Fl. Ind. i, 712.*—Vern. *Pindálu, pindar, pandára* (Saharanpur), *panár* and *pirár* (Oudh), *mainphal* (Garhwal).

A small rigid tree. *Branchlets* 4-angled, bearing at their extremities 1-4 decussate spines about ½ in. long. *Leaves* crowded towards the ends of the branchlets, 2-8 in. long, obovate or oblong, obtuse, narrowed below into the short slender petiole, pale when dry, shining above, pubescent on the nerves beneath; *stipules* triangular. *Flowers* solitary at the ends of suppressed branches, 1½-2 in. across, either large and sessile, or small and pedunculed, white, fragrant. *Calyx-tube* 1½ in. long, terete; lobes rounded. *Corolla* glabrous externally, that of the sessile flowers with a ring of hairs inside at the mouth of the tube. *Stigma* fusiform, 2-lobed in the sessile flowers, entire in the pedunculed. Fruit about 2 in. long, ovoid, smooth, yellow. *Seeds* compressed, smooth, closely packed in pulp.

Saharanpur and Pathri forests, Siwalik range, Dehra Dun (rare), Sub-Himalayan tracts of Pilibhit and N. Oudh (R. Thompson and Duthie's collector), Bundelkhand (Edgeworth, Duthie and Mrs. Bell). Flowers during May and June. DISTRIB. Behar, Bengal and southward to Bombay, Cent. and S. India, also in Burma. The fruit is eaten, and is used in dyeing. The foliage affords fodder for deer and village cattle.

2. **R. dumetorum,** *Lamk. Tab. Encycl. ii, 227; W. & A. Prod. 397; Royle Ill. 239; Brand. For. Fl. 273; F. B. I. iii, 110; Watt E.D.; Kanjilal For. Fl. Sch. Circ. 205; Gamble Man. Ind. Timb. 413; Collett Fl. Siml. 231; Cooke Fl. Bomb. i, 599.* R. nutans, longispina & floribunda, *DC.; W. & A. l.c.* R. Rottleri, *W. & A. l.c.* Gardenia spinosa, *Linn. f.* Posoqueria dumetorum, nutans, longispina & floribunda, *Roxb. Fl. Ind. i, 713 to 719.*—Vern. *Mainphal, maindal, mendphal* (Bijnor).

A large rigid shrub or small tree, with long opposite axillary spreading spines. *Leaves* usually fascicled. 1-2 in. long, obovate, obtuse or subacute, narrowed into the short marginate petiole, pubescent or hispid, rarely glabrous, deciduous; *stipules* ovate, acuminate. *Flowers* sub-sessile at the ends of short leaf-bearing branchlets, solitary or in pairs, rarely ternate, greenish-yellow or almost white, fragrant. *Calyx-tube* campanulate, strigose; lobes variable, ovate or spathulate. *Corolla* about as long as the calyx-lobes, hairy outside; lobes spreading, oval or oblong. *Berry* 1-1½ in. long, globose or ovoid, glabrous or pubescent, often ribbed, yellow when ripe. *Seeds* many, compressed, embedded in pulp.

Forests of Debra Dun and of the Siwalik range, Sub-Himalayan tracts from Rohilkhand to Gorakhpur, also in Bundelkhand. Flowers from April to June. DISTRIB. Sub-tropical Himalaya from Jamu eastward to Sikkim up to 4,000 ft.; Chittagong, Burma, and the Malay Peninsula; Bombay, Cent. and S. India to Ceylon; also in China. The fruit is eaten when ripe, either raw or cooked. The pulp of the unripe fruit is used for poisoning fish. The bark and fruit are medicinal.

3. **R. fasciculata,** *DC. Prod. iv, 386; F. B. I. iii, 109. Gamble Man. Ind. Timb.* 412. R. rigida, *DC.; Brand. For. Fl. 273.* Posoqueria fasciculata, *Roxb. Fl. Ind. i, 717.*

A rigid spreading shrub, about 6 ft. high. *Branches* glabrous or tomentose; *spines* axillary, rather short. *Leaves* shortly petioled, 1-5 in. long, ovate elliptic or lanceolate, acute, entire, rounded or narrowed at the base, glabrous or somewhat hairy, pale when dry; *stipules* narrowly lanceolate. *Flowers* in axillary fascicles. *Calyx-tube* terete, produced above the ovary when in flower, cylindric, circumscissa, glabrous or pubescent; teeth linear. *Corolla* white turning to yellow, fragrant, the tube long and slender; lobes oblong, apiculate. *Stigma* large, fusiform, slightly exserted. *Berry* globose, size of pea, purple, 4-seeded.

Bundelkhand (Mrs. Bell). DISTRIB. Trop. Himalaya from Nepal to Bhutan, and in the Khasia Hills; also in Burma and the Malay Peninsula.

14. GARDENIA, Linn.; Fl. Brit. Ind. iii, 115.

Shrubs or trees, armed or not. *Leaves* opposite, rarely 3-nately whorled; stipules intrapetiolar, often connate. *Flowers* often very large, terminal or axillary, solitary fascicled or rarely cymose, often dimorphic and polygamous. *Calyx-tube* various; limb tubular or dilated, variously cleft or lobed. *Corolla* very various; lobes 5-12, twisted in bud. *Stamens* as many as the corolla-lobes; *anthers* sessile or sub-sessile, linear, included, inserted in the tube. *Ovary* 1-celled; *style* stout, *stigma* clavate fusiform or 2-cleft; *ovules* numerous, 2-seriate on the 2-6 parietal placentas. *Fruit* often large, ovoid ellipsoid or globose, coriaceous or fleshy; endocarp woody or bony, polished within, sometimes splitting along the placental sutures. *Seeds* very many, inbedded in the placenta, compressed; testa thin; embryo small, in horny albumen.—Species about 60, trop. and sub-tropical.

Unarmed.

A shrub with short ovate acute cal-lobes	1. *G. gummifera.*
A small tree with long recurved cal-lobes	2. *G. latifolia.*
A small spinous shrub with dimorphic flowers	3. *G. turgida.*

1. G. gummifera, *Linn. f. Suppl. 164; Roxb. Fl. Ind. i, 709; W. & A. Prod. 395; Brand. For. Fl. 270; F. B. I. iii, 116; Watt E. D.; Gamble Man. Ind. Timb. 415; Cooke Fl. Bomb. i, 603.*—Vern. *Dikamali* (the gum-resin).

A small unarmed nearly glabrous shrub with resinous buds. *Leaves* sessile or sub-sessile, 1¼-2¼ in. long, obovate, acute or obtuse, shining, base obtuse acute or cordate, sometimes puberulous beneath; *stipules* connate, truncate or mucronate. *Flowers* 1-3 together, sub-sessile. *Calyx* pubescent; lobes short, ovate, acute. *Corolla* white turning to yellow, its tube 1-2 in., glabrous or pubescent; limb 1-3 in. across; lobes 5, oblong, obtuse. *Fruit* 1-1½ in. long, ellipsoid or oblong, smooth; pericarp thin; placentas 4-5.

Bundelkhand (Mrs. Bell). Flowers during March and April. DISTRIB. Southwards from Chota Nagpur and Bombay. The gum obtained from this plant is collected and sold together with a similar substance yielded by *G. lucida*. The fruit is eaten.

2. G. latifolia, *Ait. Hort. Kew. (ed. I), i, 294; W. & A. Prod. 395; Brand. For. Fl. 271; F. B. I. iii, 116; Watt E. D.; Cooke Fl. Bomb. i, 602; Gamble Man. Ind. Timb. 415.*—Vern. *Pápri, pápra, páphar* (Bundelkhand).

A small unarmed tree with stout branches; branchlets resinous. *Leaves* opposite or in whorls of three, subsessile, 4-8 in. long, broadly elliptic or orbicular, rounded at the apex or shortly and bluntly

acuminate, bright green above, paler beneath, glabrous or pubescent; main lateral nerves about 12 pair, glandular-hairy in the axils beneath: *stipules* connate, large, tumid. *Flowers* large, solitary or in pairs, subsessile, white turning to yellow, fragrant. *Calyx* ¾-1 in. long, hairy; limb campanulate; lobes 5-9, subulate-lanceolate, unequal, recurved, pubescent. *Corolla-tube* 2-3 in. long, pubescent outside; limb 2-4½ in. across; lobes 5-7, obliquely obovate or oblong. *Fruit* 1-2 in. in diam., globose, smooth, speckled, beaked by the calyx-limb; endocarp polished inside, *placentas* 4-5. *Seeds* many, immersed in a purplish-coloured pulp.

Bundelkhand on dry hills' (Duthie). Flowers in April and May. DISTRIB. Behar, Cent. Prov., Bombay, and S. India. The wood is suitable for turnery, and has been recommended as a substitute for box-wood.

3. G. turgida, *Roxb. Hort. Beng. 15; Fl. Ind. i, 711; Brand. For. Fl. 207; Clarke in Journ. Linn. Soc. xvii, 310; F. B. I. iii, 118; Kanjilál For. Fl. Sch. Circ. 205; Gamble Man. Ind. Timb. 416.*—Vern. *Thanella.*

A small deciduous tree. *Branches* rigid, stout, armed with strong axillary straight often leaf-bearing spines. *Bark* smooth, yellowish. *Leaves* variable, 1-4 in. long, elliptic obovate or orbicular, obtuse or acute, coriaceous, shining above, glabrous pubescent or tomentose beneath, narrowed into a short petiole, pale when dry. *Flowers* dimorphic, the males fascicled, the females solitary. *Calyx* of male flowers ¼ in. long, its mouth wide and truncate; of the fem. flowers ½-¾ in. long, the limb shortly campanulate; teeth oblong or subspathulate, foliaceous. *Corolla* salver-shaped, white, fragrant; ½-½ in. long, sub-cylindric; limb 1 in. across. *Fruit* 1-3 in. in diam., ovoid or globose, not beaked, smooth; pericarp thick, endocarp woody, shining inside; placentas 5-6.

Dehra Dun and Saharanpur Siwalike, N. Oudh. Flowers during March and April. DISTRIB. Base of Himalaya from Garhwal to Bhotan, Behar, Chota Nagpur Bombay, Cent. and S. India, also in Burma. The fruit is sometimes eaten, and both it and the root are used medicinally.

VAR. montana, *F. B. I. iii, 118; Watt E. D.; Cooke Fl. Bomb. i, 601.* G. montana, *Roxb. Fl. Ind. i, 709; W. & A. Prod. 396.* *Leaves* suborbicular, densely tomentose beneath. This variety occurs along with the type, and in many localities is even more abundant.

15. HYPTIANTHERA, W. & A.; Fl. Brit. Ind. iii, 121.

A glabrous shrub, branches terete. *Leaves* shortly petioled; stipules triangular, persistent. *Flowers* small, white, sessile in axillary fascicles, bracteolate. *Calyx-tube* turbinate; lobes 5, acute, persistent. *Corolla-tube* short, hairy within; lobes 4-5, spreading, twisted in bud. *Anthers* 4-5, sessile, oblong, obtuse, pubescent at

the base and back. *Disk* annular. *Ovary* 2-celled; *style* short, included, its branches long erect and hispid; *ovules* 6-10 in each cell, pendulous from the apex. *Berry* ovoid or globose. *Seeds* pendulous, imbricated, compressed and angled, testa thick, fibrous and plaited; embryo small.—A single species.

H. stricta, *W. & A. Prod. 399; Brand. For. Fl. 274; F. B. I. iii, 121; Watt E. D.; Gamb. Man. Ind. Timb. 417.* Randia stricta, *Roxb.; Fl. Ind. i, 526.*

An evergreen shrub or small tree, 5-10 ft. high, branching from the base; branchlets decussate. *Leaves* 3-9 in. long, ovate lanceolate or linear-lanceolate, long acuminate, entire, coriaceous, shining, glabrous, or pubescent on the nerves beneath, brown when dry; petiole ¼-½ in.; *stipules* triangular, persistent. *Flowers* ¼ in. long, white; *bracts* 2-3. *Style* short; stigma large, hairy. *Berry* size of a pea.

Forest tracts of N. Oudh in damp shady places (R. Thompson, Duthie's collector). Flowers in April. DISTRIB. Outer Himalaya up to 4,000 ft. from Kumaon eastwards to the Khasia Hills and Burma common in E. Bengal; found also in China.

16. **IXORA**, Linn.; Fl. Brit. Ind. iii, 137.

Shrubs or small trees; branches terete. *Leaves* opposite, rarely in threes; stipules interpetiolar. *Flowers* in terminal trichotomously branched often corymbiform cymes, 2-bracteolate, very rarely 5-merous. *Calyx-tube* ovoid; limb 4-toothed, persistent. *Corolla-tube* long, very slender; lobes 4, spreading, twisted in bud. *Stamens* 4, on the mouth of the corolla; *filaments* short or 0; *anther* slender, tip often mucronate, base 2-fid. *Ovary* 2-celled; *style* filiform, exserted, never twice as long as the corolla tube; *stigma* slender, fusiform; branches 2, rarely persistently connate; *ovules* solitary, peltately attached to the septum in each cell. *Fruit* globose or didymous with 2 plano-convex or ventrally concave coriaceous pyrenes. *Seeds* peltate, testa membranous, albumen horny.—Species about 100, in Trop. Asia and Africa, and a few in America.

I. parviflora, *Vahl Symb. iii, 11, t. 52; Roxb. Fl. Ind. i, 383; W. & A. Prod. 429; Brand. For. Fl. 275; F. B. I. iii, 142; Watt E. D.; Gamble Man. Ind. Timb. 421; Cooke Fl. Bomb. i, 611.*—(The Torch-tree.)

A small glabrous evergreen tree. *Leaves* sub-sessile, 3-6 in. long, oblong or elliptic, obtuse, rounded or cordate at the base, very coriacious and shining; petiole very stout; *stipules* shortly cuspidate. *Cymes* terminal, sessile, 2-6 in. long, with 3-5 pair of short decussate

branches; lower bracts stipuliform, upper and bracteoles minute or obsolete. *Flowers* many, small, in sub-globose clusters, sessile or pedicelled, white or pink, fragrant. *Calyx-teeth* very short, obtuse or sub-acute. *Corolla-tube* ½ in. long, without hairs in the mouth. *Style* hairy. *Berry* ¼ in. in diam., didymous.

In the Bahraich district of N. Oudh (Duthie's collector). Flowers during the hot and rainy seasons. DISTRIB. Bengal, Chittagong, Cent. Prov., Bombay, S. India, and Ceylon; also in Burma and the Nicobar Islands. The green branches are often used for torches.

17. PAVETTA, Linn.; Fl. Brit. Ind. iii, 149.

Characters of *Ixora*, but stipular bracts membranous, leaves usually more membranous, stipules connate into a sheath, style much longer, and ovules usually attached to a prominent placenta.—Species about 70, in the tropics of the Old World.

P. indica, *Linn. Sp. Pl. 110; W. & A. Prod. 431; Brand. For. Fl. 275; F. B. I. iii, 150; Watt E. D.; Gamble Man. Ind. Timb. 421; Cooke Fl. Bomb. i, 612;* Ixora Pavetta, *Roxb. Fl. Ind. i, 385.*

A glabrous shrub up to 4 ft. in height. *Leaves* shortly petioled, 3-9 in. long, lanceolate elliptic oblong or obovate, obtuse acute or acuminate, tapering to the base, membranous, glabrous on both surfaces; main lateral nerves 8-10 pair. *Flowers* white, fragrant, on slender pedicels, arranged in terminal sessile corymbose cymes; *bracts* broad, membranous, the lower cupular. *Calyx-lobes* very short, triangular, acute, reflexed at their tips. *Corolla-tube* twice or thrice as long as the linear-oblong sub-acute lobes. *Stigma* slender, fusiform, hairy.

Agra district (Munro), Bundelkhand (Duthie). DISTRIB. Throughout the greater part of India from Sikkim and Bengal to S. India and Ceylon; also in Burma, the Andamans, and the Malay Peninsula, extending to China and N. Australia.

VAR. tomentosa, *Hook f. in F. B. I. l.c.; Kanjilál For. Fl. Sch. Circ. 206; Cooke Fl. Bomb. i, 613.* P. tomentosa, *Roxb. ex Smith in Rees Cyclop.; W. & A. Prod. 431; Royle Ill. 238; Brand. For. Fl. 275.* Ixora tomentosa, *Roxb.; Fl. Ind. i, 386.*—Vern. *Angári* (Dehra Dun). Young branches leaves and inflorescence tomentose. *Flowers* white, arranged in 3-chotomous panicles.

Dehra Dun and Siwalik range, usually in damp ground. Flowers during April and May. DISTRIB. Outer ranges of Himalaya up to 4,000 ft. in Garhwal and Kumaon and eastward to Bhutan; also in Assam, Bengal, Cent. and S. India, Burma, and Malay Peninsula.

18. COFFEA, Linn.; Fl. Brit. Ind. iii, 153.

Shrubs with compressed branchlets. *Leaves* opposite, rarely in threes; stipules broad. *Flowers* in axillary fascicles or cymes or solitary, white or yellowish, often scented; bracteoles often connate. *Calyx-tube* short; limb short, often glandular, persistent. *Corolla-tube* short or long; lobes 4-7, spreading, twisted in bud. *Anthers* 4-7, sessile on the corolla-tube or throat, narrow, often recurved and twisted. *Ovary* 2-celled; *style* filiform, smooth, branches linear or subulate; *ovules* one in each cell, peltately attached to the septum. *Drupe* with 2 plano-convex or ventrally concave coriaceous or cartilaginous pyrenes. *Seeds* plano-convex, concave or grooved ventrally, albumen horny.—Species about 25, in the tropics of the Old World.

C. bengalensis, *Roxb. Hort. Beng. 15; Fl. Ind. i, 540; W. & A. Prod. 435; Brand. For. Fl. 277; F. B. I. iii, 153; Kanjilál For. Fl. Sch. Circ. 207; Gamble Man. Ind. Timb. 422.*

A small glabrous deciduous shrub with slender horizontal branches. *Leaves* shortly petioled, up to 5 in. long, but usually much smaller, broadly ovate or elliptic, obtusely acuminate, rounded or acute at the base, membranous, not shining, green when dry; main lateral nerves 6-10 pair, pubescent on the nerves beneath; stipules subulate, persistent. *Flowers* axillary, 1-3-nate, sometimes appearing before the leaves, 1-1½ in. across, pure white, fragrant. *Calyx-limb* with many glandular teeth. *Corolla-tube* ½-1½ in.; lobes obovate-oblong. *Berry* ½ in. long, didymous when 2-seeded, purple.

Dehra Dun, in shady places. Flowers in March and April. DISTRIB. Tropical Himalaya from Garhwal eastwards to Sikkim and Assam; also in Chittagong, Cent. and S. India and Burma, extending to Siam and Java. Very ornamental when in flower and often cultivated in gardens.

The true coffee-plant, *Coffea arabica*, L., is a native of Abyssinia and the Soudan. It is successfully grown in many parts of S. India.

19. HAMILTONIA, Roxb.; Fl. Brit. Ind. iii, 197.

A hispid pubescent or glabrate erect trichotomously branched undershrub, fœtid when bruised, branches terete. *Leaves* opposite, petioled, nerves many, stout; stipules intrapetiolar, short, acute, persistent. *Flowers* small, in broad terminal trichotomously branched panicled or subumbellate cymes, white or blue, sweet-scented, bracteate and bracteolate. *Calyx-tube* ovoid; limb of 4-5 subulate persistent segments. *Corolla* funnel-shaped, tube long;

lobes 4-5, short, valvate. *Stamens* 5, inserted in the corolla-throat; *filaments* short, subulate; *anthers* obovate-oblong, obtuse. *Ovary* 5-furrowed, outer coat almost free from the 5-celled inner coat; *style* filiform, arms 5, linear; *ovules* one in each cell, basal, erect. *Capsule* 1-celled from the absorption of the septa, 5-valved at the top, 5- (or fewer-) seeded. *Seeds* triquetrous, outer coat of testa reticulate.—Species 3 or 4, in India, Malaya and China.

H. suaveolens, *Roxb. Hort. Beng. 15; Fl. Ind. i, 544; Brand. For. Fl. 278; F. B. I, iii, 197; Watt. E. D.; Kanjilāl For. Fl. Sch. Circ. 207; Gamble Man. Ind. Timb. 425; Collett. Fl. Siml. 231; Cooke Fl. Bomb i, 621.* H. propinqua, *Done in Jaquem. Voy. Bot. t. 91.*—Vern. *Padera.*

A shrub, 4-12 ft. high, with spreading more or less herbaceous branches. *Leaves* 6-12 in. long, elliptic lanceolate or ovate, acute or acuminate, glabrous or pubescent, often rough, rigidly coriaceous; petiole ¼-1 in. *Flowers* many, sessile or sub-sessile, heads arranged in terminal 3-chotomous pubescent panicles, white or blue, fragrant; *bracteoles* minute, subulate. *Calyx-teeth* 4-5, longer than the ovary, linear or subulate, glabrous or hispid, or with gland-tipped processes. *Corolla-tube* ¼ in. long, widening upwards, pubescent or woolly outside; lobes acute, incurved at their tips. *Stamens* more or less exserted according to sex. *Style* included or exserted. *Capsule* ½-⅔ in., ellipsoid.

Dehra Dun and Siwalik range, often gregarious. Flowers from Oct. to Jan. DISTRIB. Trop. and Sub-tropical Himalaya up to 5,000 ft. from Kashmir to Bhutan; also on the Salt range and on the hills of Cent. and S. India from Parasnath as far south as Mysore. It is found in China, but was probably introduced. Often grown as an ornamental shrub in Indian gardens. The flowers are fragrant, but the crushed leaves and young stems have a most unpleasant odour.

Allied to the above is *Leptodermis lanceolata*, Wall., a very common Himalayan shrub, extending from Kashmir to Bhutan at elevations between 4,000 and 10,500 ft. It has been seen growing as low down as Sahánsoadhára in Dehra Dun, having no doubt been washed down to this place. The crushed leaves and branchlets emit a very disagreeable smell similar to that of *Hamiltonia.*

20. MORINDA, Linn.; Fl. Brit. Ind. iii, 155.

Erect or climbing shrubs or trees, branches terete or 4-gonous. *Leaves* opposite, rarely in threes; stipules connate, sheathing. *Flowers* in axillary or terminal simple panicled or umbellate peduncled heads, white, more or less connate by the calyces. *Calyx-tube* short; limb short or 0. *Corolla-tube* short or long; lobes 4-7, coriaceous, valvate in bud. *Stamens* 4-7, *filaments* short; *anthers* linear or

oblong. *Ovary* 2- or spuriously 4-celled; *style* slender, branches long or short; *ovules* solitary in each cell. *Fruit* compressed, formed of the succulent enlarged calyces inclosing many cartilaginous or bony 1-seeded pyrenes, which sometimes cohere into a 2-4-celled putamen, rarely of nearly free drupes. *Seeds* obovoid or reniform, testa membranous, albumen fleshy or horny.—Species 40, all tropical.

M. tinctoria, *Roxb. Hort. Beng. 15; Fl. Ind. i, 543, var.* tomentosa; *Hook. F. B. I. iii, 156; Brand. For. Fl. 278; Field & Gard. Crops. N.-W. P. & Oudh, iii, 55 to 59 (forma exserta); Gamble Man. Ind. Timb. 422; Cooke Fl. Bomb. i, 614.* M. exserta, *Roxb. Fl. Ind. i, 545 (in part); Brand. For. Fl. 277.*—Vern. *Al; ách, áchi.*

A small tree with 4-angled tomentose branches. *Leaves* 4-8 in. long, broadly or narrowly elliptic, acute at both ends, tomentose on both surfaces, not shining; petioles ¼-½ in. long, densely tomentose; *stipules* often bifid, with narrow acute lobes. *Pedunoles* leaf-opposed or occasionally in the axils of a reduced leaf, tomentose. *Flowers* in globose heads, 5-merous, white. *Calyx* ⅛ in. long, truncate. *Corolla-tube* about 1 in. long, hairy outside; lobes oblong, obtuse or subacute. *Fruit* about 1 in. in diam., composed of many coalescent drupes.

This tree is probably wild in the forests of Bundelkhand. Flowers during the hot season. DISTRIB. Bengal, Cent. Provinces and in the Bombay Presidency. Cultivated in many parts of Bundelkhand, and in the districts of Fatehpur, and Cawnpore for the sake of the well-known dye (*Al*) prepared from the bark of the roots.—See Agricultural Ledger, Department of Revenue & Agriculture, Government of India, No. 9 (1895).

21. KNOXIA, Linn.; Fl. Brit. Ind. iii, 128.

Erect herbs or undershrubs; stems terete, or obtusely angled, with 2 lines of pubescence. *Leaves* opposite; stipules connate with the petiole into an entire or bristly sheath. *Flowers* dimorphous, pink or lilac, subsessile on the elongating branches of terminal cymes, rarely spicate. *Calyx-tube* ovoid or didymous teeth 4, minute and subequal, or 1 or 2 elongate, persistent. *Corolla tube* long, throat villous; lobes 4, valvate in bud with inflexed tips. *Stamens* 4, inserted within the throat; *anthers* linear, exserted or included. *Ovary* 2-celled; *style* filiform, *stigma* included or exserted, 2-lobed; *ovules* 1 in each cell, pendulous. *Fruit* very small, of 2 semi-terete or dorsally compressed indehiscent cocci. *Seeds* with a thickened funicle, testa

membranous, albumen fleshy. Species 8 or 9, Indian, Malayan and Australian.

Stem softly villous all round, mericarps coalescing when ripe . . . . . 1. *K. corymbosa.*

Stem with 2 lines of pubescence, mericarps separating when ripe. . . . . 2. *K. brachycarpa.*

1. **K. corymbosa,** *Willd. Sp. Pl. i, 582; W. & A. Prod. 439; F. B. I. iii, 128; Cooke Fl. Bomb. i, 605.* Spermacoce exserta, *Roxb.; Fl. Ind. i, 367.*

An erect slender annual, 1-4 ft. high, softly hairy. *Stem* terete or obscurely 4-angled, sparingly branched; internodes long. *Leaves* 3-5 in. long, linear ovate-lanceolate or oblong, acute, narrowed to the base into a short petiole; stipular bristles ¼ in. *Flowers* in 3-chotomous corymbose cymes, very small and shortly pedicelled, white or purplish. *Calyx-teeth* minute, triangular, subequal. *Corolla* clavate, its tube hairy within; the lobes short, sub-acute. *Fruit* ¼ in. long, sessile or nearly so, perforate at the base, arranged in second spikes; *mericarps* when ripe closely united.

Dehra Dun (Duthie) Bahraich district of N. Oudh (Duthie's collector). Flowers at the end of the rainy season. DISTRIB. From Garhwal eastward to Sikkim, up to 5,000 ft., and on the Khasia Hills; throughout tropical India to Ceylon, Burma, Malaya, China, and Trop. Australia.

2. **K. brachycarpa,** *R. Br. in. Wall. Cat. 321; F. B. I. iii, 130.* Spermacoce lævis, *Roxb.; Fl. Ind. i, 368.*

An erect rather rigid herb, 2-4 ft. high. *Stem* with 2 lines of pubescence, internodes long. *Leaves* sessile, 2-4 in. long, linear-oblong, obtuse, minutely pubescent on the margins and on the nerves beneath, acute or rounded at the base, pubescence of midrib continued down the stem; *stipules* pubescent, 3- or more-cleft, the upper often entire. *Cymes* open or capitate, main branches pubescent in 2 lines, the smaller puberulous, often tomentose when capitate. *Flowers* small. *Calyx-teeth* minute, obtuse, one larger than the others. *Fruits* short, didymous, truncate.

Pilibhit district in Rohilkhand and in N. Oudh (Duthie's collector). DISTRIB. Subtrop. Himalaya in Kumaon, Parasnath in Chota Nagpur, Manipur, Pegu. The Oudh specimens have capitate cymes.

22. SPERMACOCE, Linn.; Fl. Brit. Ind. iii, 199.

Herbs or low undershrubs; branches usually square. *Leaves* opposite; stipules connate with the petioles into a broad truncate tube with marginal bristles. *Flowers* small or minute, solitary or

in axillary or terminal fascicles heads or cymes. *Calyx-tube* various, limb of 2-4, (rarely 5) teeth with often interposed teeth or bristles. *Corolla* funnel-or salver-shaped; lobes 4, valvate. *Stamens* 4, on the throat or tube of the corolla, *filaments* short or long; *anthers* linear or oblong. *Ovary* 2-celled; *style* filiform, with 2 short arms or a capitate stigma; *ovules* 1 in each cell, on the middle of the septum, amphitropous. *Fruit* of 2 coriaceous or crustaceous mericarps which dehisce variously. *Seeds* oblong, grooved ventrally, testa thin, often granulate.—Species about 30, chiefly temperate.

Stems erect, both carpels dehiscing ventrally .	1. *S. stricta.*
Stems procumbent, one carpel dehiscing ventrally, the other remaining indehiscent . .	2. *S. hispida.*

S. stricta, *Linn. f. Suppl. 120; Roxb. Fl. Ind. i, 370; F. B. I. iii; 200; Collett. Fl. Siml. 233; Cooke Fl. Bomb. i, 623.* Bgelovia lasiocarpa, Roxburghiana and Kleinii, *W. & A. Prod. 437.*

Annual. *Stems* erect, 6-14 in. high; simple or branched from the base, angles more or less scabrid with recurved prickles. *Leaves* sub-sessile, spreading or ultimately reflexed, 1-2 in. long, linear to ovate, acute and often mucronate, more or less coriaceous, glabrous or scabrid, margins often recurved; *stipules* with many long bristles. *Flowers* many, in globose compact axillary heads; *bracteoles* filiform, exceeding the calyx. *Calyx-tube* pubescent above, glabrous near the base; teeth linear-subulate, pubescent. *Corolla* ⅛ in. long, white; tube very slender; lobes linear, acute. *Stigma* sub globose. *Capsule* ¼ in. long, narrowed at the base, glabrous below, rather membranous, crowned with the erect calyx-teeth, both carpels dehiscing ventrally. *Seeds* polished.

Moradabad (T. Thomson), Bundelkhand (Mrs. Bell). DISTRIB. Trop. Himalaya from Kashmir eastwards up to 5,500 ft. and throughout India to Ceylon, Burma, the Malay Peninsula and China. The prevalent form in N.-W. India of this very variable species is *S. lasiocarpa* R. Br.

S. hispida, *Linn. Sp. Pl. 102; Roxb. Fl. Ind. i, 373; W. & A. Prod. 438; F. B. I. iii, 200; Watt E. D.; Collett Fl. Siml. 233; Cooke, Fl. Bomb. i, 624.* S. articularis, *Linn f.; Roxb. l. c.; W. & A. Prod. l. c.* S. scabra, *Willd.; Roxb. l. c. 371.*

A procumbent herb with hispid hairy or sub-glabrous stems. *Leaves* sub-sessile, ½-1½ in. long, obovate, spathulate oblong or elliptic, acute or obtuse, rigidly coriaceous, pale when dry, usually very scabrid above; margins often thickened and cartilaginous, scabrid or ciliate; *stipules* membranous, hispid, bristly. *Flowers* 4-6 in a whorl, shortly pedicelled; *bracteoles* as long as the calyx, filiform, hyaline. *Calyx* ¼ in. long, hispid; teeth linear-lanceolate, acute, reflexed, equalling the tube. *Corolla* ¼-½ in., blue or white; lobes oblong, acute, bristly outside. *Stigmas* 2, very short. *Capsule* ⅛ in. long, pubescent or hispid, rounded at the base, crowned with the calyx-teeth, one carpel dehiscing ventrally. *Seeds* not polished.

A very abundant weed within the area. DISTRIB. Subtrop. Himalaya from the neighbourhood of Simla eastwards, and south to Ceylon; also in the Malay Pen. and Islands, China and the Philippines. The root is used as an alterative, like that of *sarsaparilla*, and the seeds have been recommended as a substitute for coffee.

24 RUBIA Linn.; Fl. Brit. Ind. iii, 202.

Scabrid hispid or prickly erect diffuse or climbing herbs; stems square, slender. *Leaves* 4-8 in a whorl, rarely opposite and stipulate. *Flowers* small or minute, in axillary and terminal cymes, pedicel jointed with the ovary. *Calyx-tube* ovoid or globose; limb O. *Corolla* rotate or shortly bell- or funnel-shaped; lobes 4-5, valvate. *Stamens* 4-5, inserted on the corolla-tube, *filaments* short; *anthers* globose or oblong. *Ovary* 2-celled; *style* 2-fid or styles 2, *stigma* capitate, *ovules* one in each cell, erect, attached to the septum. *Fruit* small, didymous, fleshy, or globose by the suppression of a carpel. *Seeds* suberect, adhering to the pericarp, testa membranous.—Species about 30, chiefly temperate.

R. cordifolia, *Linn. Syst. (ed. XII). 229; W. & A. Prod. 442; Royle Ill. 237; F. B. I. iii, 202; Watt E. D.; Collett Fl. Siml. 233; Cooke Fl. Bomb. i, 625.* R. Munjista, *Roxb.; Fl. Ind. i, 374.* R. purpurea, *Dene. in Jacquem, Voy. Bot. 64, t. 92.*

A perennial climbing herb with long cylindric roots. *Branches* stout, retrorsely acabrid or glabrous. *Leaves* 4 in a whorl, two often larger and with longer petioles, 1½-4 in. long, ovate-cordate, acute, scabrid or smooth; nerves 3-7 from the base, prominent and usually retrorsely scabrid beneath; petiole 2-4 in. long; the upper leaves often acute at the base and with shorter petioles. *Flowers* minute, 5-merous, dark red, arranged in terminal cymose panicles; the branches 3-chotomous, spreading, with opposite sessile leaf-like cordate bracts. *Calyx-tube* globose, glabrous, limb obsolete. *Corolla-tube* very short; lobes 5, ovate, acute, their tips incurved. *Anthers* globose. *Fruit* didymous or globose, smooth, dark purple when ripe.

Dehra Dun and Sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers during the rainy season. DISTRIB. Throughout the hilly portions of India from the N.-W. Frontier eastwards, on the Himalaya up to 8,000 ft. and south to Ceylon and the Malay Peninsula; also in China, Japan, Java, and Trop. Africa. A valuable dye (*manjit*) is extracted from the roots and stems of this plant.

25. GALIUM, Linn.; Fl. Brit. Ind. iii, 204.

Glabrous, hispid scabrid or prickly, erect or scandent, weak herbs; branches square. *Leaves* 3 or more in a whorl, rarely opposite and

stipulate, broad or narrow. *Flowers* minute, in axillary and terminal cymes or peduncles, white yellow or greenish; pedicel jointed with the ovary. *Calyx-tube* ovoid or globose, limb 0. *Corolla* rotate or shortly funnel-shaped, lobes 4, rarely 3, valvate. *Stamens* 4, rarely 3, in the corolla-tube; *filaments* short; *anthers* didymous. *Ovary* 2-celled, *style* short, arms 2, with capitate stigmas; *ovules* one in each cell, erect, attached to the middle of the septum. *Fruit* small, didymous, dry or nearly so, smooth granulate or tuberculed, glabrous pubescent or hispid with hooked hairs. *Seed* adhering to the pericarp, plano-convex, grooved ventrally.—Species upwards of 200, mostly temperate.

A perennial herb with weak and usually prostrate stems, fruiting pedicels not recurved . . . 1. *G. asperifolium.*

An annual with ascending stems, fruiting pedicels strongly recurved . . . . . 2. *G. tricorne.*

1. G. asperifolium, *Wall. in Roxb. Fl. Ind. (ed. Carey. & Wall.) i, 381; W. & A. Prod. 442; Collett Fl. Siml. 235.* G. Mollugo *F. B. I. iii, 207 (not of Linn.).* G. parviflorum, *Don Prod. 133.*

A much-branched herb. *Stems* 2-3 ft. long, weak prostrate or pendulous and often rooting at the nodes, the angles usually rather rough. *Leaves* 4-6 in a whorl, sessile, ¼-1 in. long, lanceolate or linear-obovate, obtuse and with usually a pale-coloured apical mucro; the midrib beneath and the recurved margins armed with a few hooked prickles. *Peduncles* 3-flowered, arranged in axillary and terminal panicled leafy cymes; pedicels a little longer than the flowers. *Corolla* small, white; lobes ovate, acuminate. *Fruit* granulate, glabrous, black when ripe.

Dehra Dun (Duthie). DISTRIB. Throughout the Himalaya up to 10,000 ft., extending eastwards to Burma and south to Ceylon.

2. G. tricorne, *Stokes in With. Bot. Arr. Brit. Pl. ed. 2, 153; F. B. I., iii, 207.*

A very scabrid annual, 1-2 ft. high. *Stems* stout, retrorsely scabrid. *Leaves* 6-8 in a whorl, sessile, 1-1½ in. long, linear or oblanceolate, cuspidate, rigid; midrib prominent beneath, nerves obscure. *Peduncles* axillary, 1-3 flowered, stout, elongate. *Corolla* yellowish-white; lobes ovate acute. *Fruit* ⅝ in. in diam., glabrous or scabrous, granulate; *pedicels* strongly recurved in fruit.

Dehra Dun, in cultivated ground. Flowers in April. DISTRIB. Punjab plain to Kashmir (ascending to 13,000 ft.), Waziristan; Baluchistan to N. Africa, Europe and W. Asia.

The following are a few of the more important cultivated species belonging to genera which are not truly indigenous within the area of this flora :—

ANTHOCEPHALUS INDICUS, *A. Rich.*; *Cooke Fl. Bomb. i, 579.* A. Cadamba, *Miq*; *Brand. For. Fl. 261*; *F. B. I. iii, 23*; *Watt E. D.*; *Kanjilál For. Fl. Sch. Circle 201*; *Gamble Man. 400.* Nauclea Cadamba, *Roxb.*; Fl. Ind. i, 512.—Vern. *Kaddam, meo* (Dehra Dun). A large handsome deciduous tree with drooping horizontal branches. The fruits are densely compacted into yellow globular masses about the size of an orange. The tree is indigenous along the Sub-Himalayan tracts from Nepal eastwards; also in E. Bengal, S. India, and in Ceylon. It flowers during the hot season. For information regarding its economic properties, etc., Watt's Dictionary Econom. Prod. of India should be consulted.

CINCHONA spp. The attempts to form *cinchona* plantations on the slopes of the W. Himalaya failed by reason of the excessive low temperature during the winter months. A full account of the successful introduction of the quinine-yielding species from S. America will be found in Sir George Watt's article on *Cinchona* in Vol. ii of the Dictionary of the Economic Products of India.

MUSSÆNDA FRONDOSA, L. is very much grown in gardens as an ornamental shrub. It presents a conspicuous object by reason of the development of one of the calyx-segments of each flower into a white membranous leaf. It is indigenous in Assam and Upper Burma, also in W. and S. India and in Ceylon.

HAMELIA PATENS, *Jacq.*, a native of the W. Indies, is often met with in the gardens of Upper India. It is a handsome evergreen shrub with reddish-yellow flowers.

LXI.—COMPOSITÆ.

HERBS or shrubs, rarely trees. *Leaves* alternate rarely opposite, simple or compound; stipules 0. *Inflorescence* a centripetal head of many small flowers, sessile on the dilated top of the peduncle (receptacle), inclosed in an involucre of whorled bracts; floral bracts 0, or reduced to scales or bristles on the receptacle. *Flowers* all tubular (head discoid), or the outer, or all, ligulate (head rayed), all 2-sexual, or the inner 2-sexual or male, the outer female or neuter, sometimes dicœcious. *Calyx* superior, limb 0 or of hairs (pappus) or scales. *Corolla* of 2 forms: 1st tubular or campanulate, 45-lobed, lobes valvate, with marginal nerves; 2nd, ligulate, lobes elongate and connate into a strap-shaped or elliptic ligule. *Disk* epigynous. *Stamens* 4-5, inserted within the corolla-tube; *filaments* usually free; *anthers* basifixed, usually connate, connective produced upwards; cells simple or tailed at the base; pollen globose

rough. *Ovary* 1-celled; *style* slender, 2-fid, arms (sometimes connate) linear, ½-terete, naked or externally pubescent or tipped by pubescent cones, margins stigmatic; *ovule* solitary, basal erect, anatropous, nucellus with one coat. *Fruit* (an achene) dry, indehiscent. *Seed* erect, testa membranous, endosperm 0, embryo straight.—Co-extensive with dicotyledonous vegetation; genera about 1,000, species over 8,000.

SERIES I.—TUBULIFLORÆ. *Flowers* all tubular, or the outer only ligulate. *Juice* watery.

TRIBE I.—VERNONIEÆ. *Heads* homogamous. *Flowers* all 2-sexual and tubular, never yellow. *Anthers* cleft at the base (not tailed). *Style-arms* subulate, hairy. *Leaves* usually alternate.

- Heads distinct, many-flowered. Pappus long, copious, usually with an outer row of short hairs or bristles . . 1. VERNONIA.
- Heads congested, 1-few-flowered, surrounded by leafy bracts; pappus of 4-5 bristles . . . . . 2. ELEPHANTOPUS.

TRIBE II.—EUPATORIEÆ. *Heads* homogamous. *Flowers* all 2-sexual and tubular, never yellow. *Anthers* subentire at the base. *Style-arms* obtuse, minutely papil-lose. *Pappus* usually bristly. *Leaves* opp. or the upper alternate.

- Anthers with a truncate apex . . 3. ADENOSTEMMA.
- Anthers appendaged at the apex . . 4. AGERATUM.

TRIBE III.—ASTEROIDEÆ. *Heads* heterogamous, rayed or discoid, or homogamous and rayless. *Anthers* subentire at the base. *Style-arms* flattened or planoconvex, all or those of the disk-flowers terminated by a cone (truncate in *Centipeda*). *Disk-flowers* yellow (except in *Cyathocline*). *Leaves* usually alternate.

- Outer flowers of the heads fem., 2-many-seriate, not longer than the disk; pappus 0, or (in *Dicrocephala*) of 2-3 minute bristles.
  - Style-arms of disk-flowers truncate; flowers all yellow . . . 5. CENTIPEDA.
  - Style-arms of disk-flowers tipped with a cone.
    - Achenes compressed and with a thickened border; cor. of outer flowers pink or purplish, of the disk yellow . . . 6. DICROCEPHALA.

Achenes without a thickened border.

Pappus 0, flowers rose-purple . . . . . 7. CYATHOCLINE.

Pappus cup-like, flowers yellow . . . . . 8. GRANGEA.

Heads with distinct ray-flowers.

Corolla of ray-flowers ligulate, never yellow . . . . . 9. ERIGERON.

Flowers all yellow, those of the ray slender, tubular, rarely (in *Conyza*) with short ligules.

Pappus long, copious . . 10. CONYZA.

Pappus short, scanty, dilated at the base . . . . . 11. THESPIS.

TRIBE IV.—INULOIDEÆ. *Heads* with the flowers all similar and tubular (except in *Inula* and *Pulicaria*) *Anther-cells* tailed. *Style-arms* linear, obtuse, or styles of the sterile flowers undivided. *Flowers* all yellow (except in *Blumea* and *Pluchea*). *Leaves* alt.

Heads androgynous; invol-bracts dry or herbaceous, rarely subscarious; receptacle naked, style-arms of 2-sexual flowers filiform, not truncate; style of sterile flowers entire.

Heads corymbose or panicled, not in globose masses (except in some *Blumeas*); pappus copious.

Invol-bracts narrow. Herbs. Anther-cells tailed . . 12. BLUMEA.

Anther-cells not tailed . . 13. LAGGERA.

Invol-bracts broad. Shrubs or undershrubs . . . . 14. PLUCHEA.

Heads in dense globose or ovoid masses, cor. of fem. flowers filiform; pappus 0. A herb with winged stems . . . . 15. SPHÆRANTHUS.

Heads androgynous, often in dense clusters; invol-bracts scarious or hyaline; ray-flowers fem., numerous, filiform, often inclosed in the long outer

scales of receptacle, disk-flowers 2-sexual; style-arms not truncate. Woolly herbs.

- Pappus-hairs simple . . . 16. FILAGO.
- Pappus-hairs plumose . . . 17. IFLOGA.

Heads androgynous or homogamous; invol-bracts scarious and usually hyaline, receptacle naked or pitted; flowers all fertile and with divided styles; style-arms of 2-sexual flowers truncate. Hoary or woolly herbs . 18. GNAPHALIUM.

Heads homogamous, discoid, arranged in axillary clusters; invol-bracts large, membranous; flowers all fertile; receptacle with a few palese to the outer flowers; style-arms short, clavate; pappus of 2 ovate scales . 19. CÆSULIA.

Heads heterogamous, rayed (rarely subdiscoiform); flowers usually all fertile; receptacle naked or pitted; style-arms of 2-sexual flowers rounded or dilated at the apex.

- Pappus in a single row . . . 20. INULA.
- Pappus with an outer row of short scales . . . . . 21. PULICARIA.

TRIBE V.—HELANTHOIDEÆ. *Heads* heterogamous, usually rayed, or homogamous and rayless. *Ray-flowers* fem., fertile or neuter. *Disk-flowers* 2-sexual, fertile or sterile. *Receptacle* paleaceous. *Anther-bases* not tailed. *Style-arms* of disk-flowers truncate or appendiculate, of the sterile flowers not divided. *Achenes* usually angled. *Pappus* of 2-5 bristles, or paleaceous or 0.

Heads monœcious (fem. and 2-sexual), bisexual flowers sterile, with undivided styles; fem. flowers apetalous; anthers nearly free, filaments 1-adelphous; invol-bracts of fem. flowers forming an ovoid 2-beaked utricle covered with hooked spines; pappus 0. Leaves alternate . . . . 22. XANTHIUM.

Heads heterogamous, rayed or discoid, or homogamous and rayless; ray-flowers fem., fertile or sterile; disk-flowers 2-sexual or the innermost rarely sterile; receptacle paleaceous;

pappus cup-shaped or of 2-5 paleaceous bristles or 0; achenes all thick, those of the ray triquetrous, of the disk laterally compressed. Leaves usually opposite.

Inner invol-bracts or the outer paleæ of receptacle embracing the fertile achenes; outer invol-bracts 5, narrow, glandular . . . . 23. SIEGESBECKIA.

Inner invol-bracts not embracing the achenes.

Paleæ of receptacle flat and narrow, outer invol-bracts many . . . . . 24. ECLIPTA.

Paleæ of receptacle concave, embracing the achenes.

Ray-flowers sterile, ligulate, yellow; pappus 0, or a ring . 25. SCLEROCARPUS.

Ray-flowers fertile.

Ligules small, yellow or whitish; achenes not ciliate; pappus of 2-5 bristles, connate at base. . . 26. BLAINVILLEA.

Ligules large, yellow; achenes not ciliate; pappus 0; or a toothed cup or ring or of short scales . 27. WEDELIA.

Ligules small, white or yellow; achenes ciliate; pappus 0 or of 2-8 bristles . 28. SPILANTHES.

Heads heterogamous and rayed, or homogamous and rayless; ray-flowers fem. or neuter; disk-flowers 2-sexual and fertile, or the inner rarely sterile; receptacle paleaceous; achenes more or less dorsally compressed; pappus or 2-4 awns, or 0.

Style-arms with a short appendage.

Leaves alt., pinnatisect; ray-flowers fertile; achenes 2-awned . . . . . 29. GLOSSOCARDIA.

Leaves opp., toothed lobed or pinnatisect; ray-flowers sterile; achenes 2-4-awned . 30. BIDENS.

Style-arms with a long appendage; ray-flowers fertile; leaves pinnatifid or toothed.
Leaves mostly radical; achenes with 2 persistent bristles . 31. GLOSSOGYNE.
Leaves mostly cauline, alt.; achenes not awned . . 32. CHRYSANTHELLUM.

Heads heterogamous and rayed: flowers all fertile; receptacle paleaceous; pappus of scales or of plumose bristles.
Pappus-scales fimbriate. . . 33. GALINSOGA.
Pappus scales awned, plumose . 34. TRIDAX.

TRIBE VI.—ANTHEMIDEÆ. *Heads* heterogamous, rayed or discoid, or homogamous and rayless. *Involucre-bracts* 2-many-seriate, dry or with scarious tips. *Receptacle* usually naked. *Anther-cells* not tailed. *Style-arms* truncate. *Pappus* coroniform, ear-shaped or 0. *Leaves* usually alt.

Heads rayed . . . . . 35. MATRICARIA.
Heads disciform.
Heads solitary, on slender peduncles; cor. of disk-flowers 4-fid. . . 36. COTULA.
Heads racemose or panicled: cor. of disk-flowers 5-fid . . . . 37. ARTEMISIA.

TRIBE VII.—SENECIONIDEÆ. *Heads* heterogamous, rayed or discoid, or homogamous and rayless. *Involucre-bracts* usually 1-seriate, subequal, with a few shorter outer ones below. *Receptacle* usually naked. *Anther-cells* obtuse at the base, rarely tailed (in *Senecio*). *Style-arms* of 2-sexual flowers truncate or appendaged. *Pappus* of fine hairs. *Leaves* usually alternate.

Heads homogamous, the flowers all tubular, pinkish-violet or white, style-arms appendaged . . . . . 38. EMILIA.
Heads heterogamous the fem. flowers usually ligulate, style-arms truncate . 39. SENECIO.

TRIBE VIII.—CYNAROIDEÆ. *Flowers* all tubular. *Involucre-bracts* many-seriate, imbricate, tips often with a scarious spinous or leafy appendage. *Receptacle* densely bristly or paleaceous, rarely simply pitted, often fleshy. *Cor-limb* narrow, deeply 5-fid. *Anther-cells* tailed. *Style* subentire, or with short hairy arms thickened towards the base. *Pappus* of pales or bristles, rarely 0. Achenes often hard. *Leaves* alt. frequently spinous.

Heads 1-flowered, crowded into involucrate balls; achenes villous, pappus of bristles . . . . 40. ECHINOPS.

Heads usually many-flowered, separate; achenes glabrous.

Achenes with a horizontal areole.

Leaves and invol. spinous, pappus-hairs plumose. . . 41. CNICUS.

Leaves and invol. unarmed.

Filaments glabrous, pappus 1-2-seriate, inner plumose 42. SAUSSUREA.

Filaments hairy, pappus scales many-seriate . 43. GONIOCAULON.

Achenes with an oblique or lateral areole.

Heads homogamous, flowers all 2-sexual and fertile, achenes smooth or faintly ribbed . . 44. TRICHOLEPIS.

Heads heterogamous; outer flowers 1-seriate, neuter; achenes strongly 5-15-ribbed . 45. VOLUTARELLA.

TRIBE IX.—MUTISIACEÆ. *Heads* hetero or homogamous, rayed or not. *Invol-bracts* many-seriate (spinescent in *Dicoma*). *Receptacle* rarely paleaceous. *Corolla* deeply 5-fid. or 2-lipped. *Anther-cells* tailed. *Style-arms* rounded or truncate, not appendaged. *Pappus* various. *Leaves* usually alternate.

Flowers all tubular and 2-sexual, or (in *Dicoma*) the outermost sometimes fem. and shortly ligulate.

Pappus-hairs simple. A small tree 46. LEUCOMERIS.

Pappus-hairs feathery. A small rigid shrub . . . . 47. DICOMA.

Flowers all ligulate. A small erect evergreen shrub . . . . 48. CATAMIXIS.

SERIES II.—LIGULIFLORÆ. *Flowers* all ligulate. *Juice* watery.

TRIBE X.—CICHORIA *Heads* homogamous. *Corollas* all ligulate, truncate, 5-toothed. *Anther-bases* sagittate, rarely tailed. *Style-arms* slender. *Leaves* radical or alt.

Achenes narrowed at both ends, beaked or not.

Achenes, fusiform rarely beaked . 49. CREPIS.

Achenes ovoid, oblong, or narrow, more or less compressed, usually beaked . . . . . 50. LACTUCA.

Achenes not beaked.

Achenes oblong, with 4-5 rugose ribs; outermost bracts with broad scarious margins . . 51. PRENANTHES.

Achenes compressed, ovoid or obovoid; ribs smooth or rugose . 52. SONCHUS.

Achenes columnar, truncate at both ends . . . . . 53. LAUNÆA.

1. VERNONIA, Schreb.; Fl. Brit. Ind. iii, 229.

Herbs, shrubs, climbers or small trees. *Leaves* alternate. *Heads* terminal or axillary, solitary cymose or panicled, homogamous. *Involucre* ovoid globose or hemispheric, equalling or shorter than the flowers; *bracts* in many series, inner longest. *Receptacle* naked or pitted, sometimes shortly hairy. *Corollas* all equal, tubular, slender; lobes 5, narrow. *Anther-bases* obtuse. *Style-arms* subulate. *Achenes* striate ribbed or angled, rarely terete. *Pappus* of many hairs, often girt with a row of outer short hairs or flattened bristles.—Species about 380, chiefly tropical.

Heads ½ in. or more in diam., achenes hairy or silky.

Achenes ribbed, heads in terminal corymbs.

Heads fascicled in term. corymbose panicles; outermost invol-bracts subulate, the inner linear.—A perennial herb . 1. *V. Roxburghii.*

Heads subcorymbose; invol. bracts all linear, the inner with broad purplish tips.—An annual . . . . . 2. *V. anthelmintica.*

Achenes terete, not ribbed, heads subsolitary . . . . . 3. *V. revoluta.*

Heads small, about ¼ in. in diam.

Achenes ribbed.—Small shrubs.

Achenes glabrous . . . . . 4. *V. divergens.*

Achenes hispid . . . . . 5. *V. cinerascens.*

Achenes not ribbed, pubescent. A herb . 6. *V. cinerea.*

1. V. Roxburghii, *Less. in Linnæa (1831), 674; F. B. I. iii, 232; Kanjilal. For. Fl. Sch. Circ. 209.* Vicoa aspera, *DC. (not of Ham.).* Eupatorium asperum, *Roxb. Fl. Ind. iii, 415.* E. pyramidale, *Don. Prod. 170.*

An erect rigid scabrid perennial herb or under-shrub. *Leaves* subsessile, 4-5 in. long, elliptic or obovate-lanceolate, acuminate, deeply serrate, subcoriaceous, rough on both surfaces; nerves sharply prominent beneath. *Heads* many, ¼-½ in. in diam., fascicled in terminal panicled corymbs. Outer *bracts of involucre* subulate; inner ¼ in., linear, obtuse and apiculate, or acuminate and pungent; all more or less woolly outside. *Achenes* 1/10 in. long, sparsely hairy between the ribs. *Pappus* dirty white or reddish.

Dehra Dun, Siwalik range, and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh, chiefly in sal forests; also in Bundelkhand. Flowers during the cold season. DISTRIB. Kumaon, Bengal, Burma, and in C. and W. India.

2. V. anthelmintica, *Willd. Sp. Pl. iii, 1634; F. B. I. iii, 236; Collett Fl. Siml. 245; Watt E. D.* Serratula anthelmintica, *Roxb. Fl. Ind. iii, 405; Cooke Fl. Bomb. ii, 10.* Vern. *Kali ziri.*

A tall robust glandular-pubescent annual. *Stem* 2-3 ft., much branched, striate, often blotched with purple. *Leaves* shortly petioled, 3-8 in. long, lanceolate or ovate-lanceolate, acute, coarsely serrate, membranous, rather rough. *Heads* ¼-½ in. in diam., sub-corymbose, many flowered; peduncles long, dilated upwards. *Bracts of involucre* linear; outer ones hairy and herbaceous, shorter than the inner; intermediate with herbaceous hairy tips, often constricted below the herbaceous portion; innermost usually the longest, subacute, scarious and with purplish tips. *Achenes* ¼ in., narrowed towards the base, 10—ribbed, black, hairy. *Pappus* reddish with an outer row of short rigid persistent scales.

Found in many parts of the area, but nowhere truly wild. Flowers during the cold season. DISTRIB. Throughout the plains of India and up to 5,500 ft. on the Himalaya. Often cultivated near villages for the seeds (achenes), a preparation of which is used as a remedy for skin diseases, and as a powder to drive away fleas.

3. V. revoluta, *Ham. in Trans. Linn. Soc. xiv, 218; F. B. I. iii, 233.* V. oligocephala, *Edgew. in Trans. Linn. Soc. xx, 63.*

A dwarf perennial puberulous herb, branching from the somewhat woody base. *Stems* 2-6 in., erect or ascending, slender, angled, grooved. *Leaves* sessile, erect, about 1 in. long, linear, apiculate; midrib prominent; margins revolute, entire. *Heads* subsolitary, ¼ in. in diam., 30-40 flowered. *Bracts of involucre* few, broadly oblong-lanceolate, acuminate, puberulous; outermost narrowly subulate, often recurved;

inner ½ in. long, scarious. *Corolla* purple, its lobes hairy. *Achenes* terete, appressedly hairy. *Pappus* white, sub-persistent, outer row absent.

Dehra Dun and Siwalik range, Sub-Himalayan tracts of Rohilkhand and N. Oudh (Duthie's collector). Flowers March to June. DISTRIB. Garwal to Bhutan, also in N. Bengal..

4. V. divergens, *Edgew. in Journ. As. Soc. Beng. xxi (1833), 172; F. B. I. iii, 234; Cooke Fl. Bomb. ii, 11.* V. aspera, *Ham. (in part).*

An erect perennial shrub-like herb, 4-8 ft. high. *Stem* stout, pubescent tomentose or scabrid. *Leaves* petioled, 2-5 in. long, elliptic-ovate or lanceolate, acute, serrate, prominently nerved and reticulate beneath. *Heads* shortly pedunculed, ¼ in. in diam., usually clustered in rounded much-branched panicled corymbs. *Bracts of involucre* few, oblong, obtuse, scarious with greenish tips; the outermost smaller, ovate. *Corolla* purple, glabrous. *Achenes* $\frac{1}{10}$ in., 10-ribbed. *Pappus* hairs pale reddish-brown or dirty white, scabrid, outer scanty or 0.

Siwalik range (Gamble), Bundelkhand (Edgeworth). DISTRIB. Chota Nagpur, C. India and from Konkan south to Travancore; also in Assam and Burma.

5. V. cinerascens, *Schultz-Bip. in Schweinf. Ethiop, 162; F. B. I. iii, 237; Cooke Fl. Bomb. ii, 10.* Vern. *Lalia (Merwara).*

A low woody much-branched shrub up to 3 ft. high, clothed with grey pubescence. *Branches* terete, grooved, whitish. *Leaves* sessile, ½-1½ in. long, spathulate, rounded and often apiculate; tapering to a narrow base, entire or serrate, gland-punctate and pubescent on both surfaces. *Heads* ¼ in. in diam., on the spreading branches of terminal corymbose cymes. *Involucre-bracts* ¼ in., linear, subacute or mucronate. *Corolla* purple, glabrous. *Achenes* $\frac{1}{10}$ in., tapering to the base, 5-ribbed, clothed with rather stiff hairs. *Pappus* white, the outer series short and rigid, all persistent.

Mowa Bir near Ajmere (Duthie), Merwara (Duthie) Flowers during the cold season. DISTRIB. Punjab plain, Salt Range, Sindh, Baluchistan, Waziristan and westward to the Nile region of Tropical Africa. Closely allied to *V. atriplicifolia*, Jaub. & Spach, which occurs in the same region of Trop. Africa.

6. V. cinerea, *Less. in Linnæa iv, 291; F. B. I. iii, 233; Watt E. D.; Collett Fl. Siml. 245; Cooke Fl. Bomb. ii, 10.* V. rhomboidea and montana, *Edgew. in Trans. Linn. Soc. xx, 62.*

An erect rarely decumbent herb, 6-18 in. high, more or less pubescent. *Stem* terete, slightly branched. *Leaves* shortly petioled, up to 3 in. long, ovate or lanceolate, obtuse or acute, obscurely or deeply crenate or serrate, membranous or subcoriaceous, hairy on both sides. *Heads*

about ¼ in. in diam., in rounded or open and flat-topped corymbs; peduncles slender, bracteate. *Bracts of the involucre* linear-lanceolate, mucronate or awned, silky outside. *Corolla* pink or lilac, the lobes pubescent. *Achenes* $\frac{1}{16}$ in., terete, not ribbed, clothed with appressed white hairs. *Pappus* ⅛ in., white or dirty white, outer row very short.

Abundant within the area and very variable, especially in regard to its foliage. Flowers towards the end of the cold season. DISTRIB. Throughout India up to 8,000 ft. on the Himalaya also in China. The seeds are used medicinally, and the leaves are sometimes eaten as a pot herb.

2. ELEPHANTOPUS, Linn.; Fl. Brit. Ind. iii, 242.

Rigid herbs. *Leaves* alternate. *Heads* homogamous, of 2-5 flowers collected into a head-like cluster. *Involucre* compressed; *bracts* about 8, dry, stiff, alternately flat and conduplicate. *Receptacle* naked. *Flowers* all equally 4-lobed and cleft on one side and with the lobes spreading somewhat palmately. *Anthers* sagittate at the base, with obtuse auricles. *Style-arms* subulate. *Achenes* truncate, 10-ribbed. *Pappus-bristles* rigid, shining, slender and dilated below or chaff-like.—Species 10-12, chiefly tropical American.

E. scaber, *Linn. Sp. Pl. 814; Roxb. Fl. Ind. iii, 445; Royle Ill. 248; Don. Prod. 169. F. B. I. iii, 242; Watt E. D.; Cooke Fl. Bomb. ii, 12.*

A dichotomously branched herb with stout deeply penetrating roots. *Stem* 1 to 2 ft. high, erect, rigid, terete, scabrid strigose and villous. *Leaves* mostly radical, 4-5 in. long, obovate-oblong, tapering towards the base, margins crenate; cauline few, sessile or nearly so, scabrous on both surfaces, ciliate on the margins, veins prominent beneath. *Heads* many, sessile, forming a large terminal flat-topped inflorescence about 1 in. in diam. and surrounded at the base by 3 cordate leaf-like bracts. *Bracts of involucre* 8, in two rows, linear, acuminate, pungent, the inner scarious. *Flowers* violet or purple. *Achenes* somewhat hairy. *Pappus* of 4-5 rigid bristles dilated at the base.

Rohilkhand and N. Oudh (Duthie's collector), Bundelkhand (Edgeworth, Duthie). Flowers in October. DISTRIB. Throughout India and in Ceylon; extending to the Malay Peninsula, China Australia, Trop. Africa and America. The root and leaves are used medicinally, the latter as an external application to wounds and bruises.

3. ADENOSTEMMA, Forst.; Fl. Brit. Ind. iii, 242.

Glabrous or glandular-pubescent herbs. *Leaves* mostly opposite. *Heads* corymbose, homogamous. *Involucre* campanulate; *bracts*

many, sub-2-seriate, narrow, herbaceous, sometimes connate. *Receptacle* flat, naked. *Corollas* all equal, tubular, regular; tube short; limb campanulate, 5-toothed. *Anthers* truncate and with a glandular tip, base obtuse. *Style-arms* elongate, dilated above. *Achenes* obtuse, 5-ribbed, often glandular. *Pappus-hairs* 3-5, short, rigid, often clavate, inserted in a short ring.—Species 5 or 6, chiefly American, including the following which is cosmopolitan.

A. viscosum, *Forst. Char. Gen. 90; F. B. I. iii, 242; Collett Fl. Siml. 246; Cooke Fl. Bomb. ii, 13.* A. Roylei, *DC.* A. elatum and latifolium, *Don. in DC. Prod. v, 112.* Ageratum aquaticum, *Roxb. Fl. Ind. iii, 416.*

An erect, rarely decumbent annual, 1-3 ft. high, gland-pubescent or nearly glabrous, slender or robust. *Leaves* sessile or the lower ones petioled up to 6 in. long, linear to broadly ovate or cordate, coarsely serrate. *Heads* discoid, about ¼ in. in diam., arranged in lax or dense panicles or corymbs. *Involucre-bracts* oblong, obtuse or acute, glabrous glandular or scabrid. *Flowers* white. *Achenes* ⅛ in. long, glabrous or rough with glandular tubercles.

A common weed in many parts of the area, especially in wet ground. DISTRIB. Throughout India, extending up to 6,000 ft. on the Himalaya; also in Ceylon, China and in all tropical countries.

4. AGERATUM, Linn.; Fl. Brit. Ind. iii, 243.

Erect herbs or shrubs. *Leaves* opposite or the upper alternate. *Heads* corymbose or panicled, homogamous. *Involucre* campanulate; *bracts* 2-3-seriate, linear, subequal. *Receptacle* flat or nearly so, naked or with caducous scales. *Corollas* all tubular, equal, regular, limb 5-cleft. *Anthers* appendaged, base obtuse. *Style-arms* elongate, obtuse. *Achenes* 5-angled. *Pappus* of 5 short free or connate scales, or of 10-20 narrow unequal scales.—Species about 16, probably all American.

A. conyzoides, *Linn. Sp. Pl. 839; F. B. I. iii, 243; Collett Fl. Siml. 246; Cooke Fl. Bomb. ii, 14.* A. cordifolium, *Roxb. Fl. Ind. iii, 415.*

A softly hairy annual 1-2 ft. high. *Stem* branched, terete. *Leaves* petioled, up to 5 in. long, ovate, cuneate to subcordate at the base, crenate. *Heads* many, small, discoid, arranged in dense terminal corymbs. *Bracts of involucre* linear, acute, ribbed on their backs. *Flowers* many, the corolla pale blue or white. *Achenes* angled, often glandular, black. *Pappus*-scales 5, connate below, awned and often barbed.

Abundant within the area especially on the banks of streams and irrigation channels. Flowers in January and February. DISTRIB. Throughout India and in all warm countries. It is found up to 5,000 ft. on the Himalaya.

5. CENTIPEDA, Lour.; Fl. Brit. Ind. iii, 317.

Annual or perennial herbs. *Leaves* alternate, entire or toothed. *Heads* small, sessile on the branches or racemose, heterogamous, disciform, yellow. *Outer flowers* female, many-seriate, fertile; corolla minute, obscurely lobed. *Disk-flowers* 2-sexual, few, fertile; tube short, limb campanulate, 4-fid. *Involucre* hemispheric; *bracts* 2-seriate, spreading in fruit. *Receptacle* naked. *Anther-bases* obtuse, entire. *Style-arms* of 2-sexual flowers short, truncate. *Achenes* 4-angled, tip obtuse, angles hairy, hairs sometimes hooked. *Pappus* 0.—Species 3, in Asia, Australia and Trop. S. America.

C. orbicularis. *Lour. Fl. Cochinch. ii, 493; F. B. I. iii, 317; Cooke Fl. Bomb. ii, 46.* Myriogyne minuta, *DC.; Royle Ill. 248.* Artemisia sternutatoria, *Roxb. Fl. Ind. iii, 423.*—Vern. *Nukchinkni.*

A prostrate glabrous or sparsely woolly annual. *Stems* numerous, spreading from the root; 4-8 in. long, slender, leafy. *Leaves* many, subsessile, ½-1 in. long, obovate-oblong, tapering to the base, teeth few. *Heads* ⅛-¼ in. in diam., axillary, solitary, subsessile. *Involucre-bracts* very small, oblong, obtuse, the edges membranous. *Achenes* minute.

Abundant within the area in wet places. Flowers during the cold season. DISTRIB. Throughout the plains of India and in Ceylon, extending to Afghanistan, E. Trop Asia, Australia and the Pacific Islands. The powdered herb is sold in druggists' shops as a remedy for colds and toothache.

6. DICROCEPHALA, DC.; Fl. Brit. Ind. iii, 245.

Annuals. *Leaves* alternate, toothed lyrate or pinnatifid. *Heads* very small, panicled, heterogamous, globose or hemispheric, not rayed. *Outer flowers* many-seriate, female, fertile, slender, rigid, 2-3-toothed or cleft. *Disk-flowers* 2-sexual, fertile, narrow, 4-5-toothed. *Involucre* small; *bracts* sub-2-seriate, slightly unequal and with dry margins. *Receptacle* somewhat contracted within the margin, elevated, the top flat and naked. *Corolla* of fem. flowers slender, rigid, minutely 2-3-toothed, or expanded into a 3-4-fid limb; of 2-sexual flowers regularly tubular, with a narrowly campanulate 4-5-toothed limb. *Anther-bases* truncate. *Style-arms* of the 2-sexual

flowers short, flattened, tips lanceolate. *Achenes* compressed and with a thickened border. *Pappus 0*, or in the 2-sexual flowers of 2 minute bristles.—Species 5, in Asia and Africa.

D. latifolia. *DC. in Wight Contrib. 11; F. B. I. iii, 245; Collett Fl. Siml. 247; Cooke Fl. Bomb. ii, 14.* Cotula sinapifolia, *Roxb.; Fl. Ind. iii, 437.* Ethulia integrifolia, *Don Prod. 182.*

An erect or spreading branched annual, up to 2 ft. high, pubescent or glabrous. *Leaves* petioled, very variable, 2-3 in. long, ovate or lanceolate, entire pinnatifid or lyrate, coarsely toothed, terminal lobe broadly ovate. *Heads* about ½ in. in diam., on slender divaricating bracteate pedicels. *Involucre-bracts* very small, linear, the margins scarious. *Receptacle* much raised, naked. *Corolla* of outer flowers filiform, curved, pink or purplish, obscurely 2-toothed; of disk flowers yellow, 4- or 5-toothed. *Achenes* under ⅛ in. long, smooth.

Dehra Dun (King, Duthie). Flowers during the rainy season. DISTRIB. Himalaya up to 9,000 ft. from Simla to Sikkim also on the Khasia range from C. and W. India to Ceylon; extending to China and Trop. Africa.

7. CYATHOCLINE, Cass.; Fl. Brit. Ind. iii, 246.

Erect annual odorous herbs. *Leaves* alternate, pinnatisect. *Heads* small, panicled, heterogamous, not rayed. *Outer flowers* many-seriate, female fertile. *Disk-flowers* hermaph., usually sterile, regular, 5-cleft. *Involucre* hemispheric; *bracts* sub-2-seriate, lanceolate, acute, margins scarious. *Receptacle* with a contracted base, elevated; top concave, naked. *Anther-bases* truncate. *Style* exserted, of hermaph. fl. simple or cleft. *Achenes* minute, oblong, smooth. *Pappus 0.*—Species 2, both in India.

C. lyrata. *Cass. in Ann. Sc. Nat. Ser. I. xviii, 420; Royle Ill. 248; F. B. I. iii, 246; Collett Fl. Siml. 249; Cooke Fl. Bomb. ii, 15.*

An erect sparsely hairy sweet-scented herb. *Stem* 1-2 ft. high, slender, branched, softly pubescent. *Leaves* sessile, 1-5 in. long; lower obovate, upper pinnatifid, segments toothed. *Heads* discoid, ¼ in. in diam., arranged in small rounded panicled corymbs. *Involucre-bracts* ciliate on the scarious margins. *Flowers* rose-purple or occasionally white corollas of the outer rows very slender *Achenes* minute, smooth.

Found in many parts of the area, especially on the banks of streams and in moist situations. Flowers during the cold season. DISTRIB. Throughout the greater part of N. and C. India, ascending to 5,000 ft. on the Himalaya; also in Bengal, Burma, and China.

8. GRANGEA, Forsk.; Fl. Brit. Ind. iii, 246.

Suberect or prostrate villous herbs. *Leaves* alternate, pinnatifid. *Heads* terminal or leaf-opposed, subglobose, not rayed, yellow. Outer fl. 1-8-seriate, female, fertile, filiform; outermost 2-fid.; inner 2-4 fid. *Disk-fl.* hermaph., fertile; tube very slender; limb campanulate, 4-5-cleft. *Involucre* broadly campanulate; *bracts* few-seriate, outer herbaceous. *Receptacle* convex or conic, naked. *Anther-bases* obtuse. *Style-arms* of hermaph. fl. flattened, cuneate, obtuse or with triangular points. *Achenes* flattened or subterete. *Pappus* cupular.—Species 3 or 4, in Trop. Asia and Africa.

G. maderaspatana, *Poir. Encycl. Suppl. ii, 825; Royle Ill. 248; F. B. I. iii, 247; Watt E. D.; Cooke Fl. Bomb. ii, 16.* Artemisia maderaspatana, *Roxb. Fl. Ind. iii, 422.*

A pubescent or villous annual. *Stems* many, prostrate and spreading from the root, forming circular patches 6-12 in. broad or more. *Leaves* many, sessile, 1-2½ in. long, sinuately pinnatifid, pubescent on both surfaces; lobes coarsely toothed, the terminal one the largest. *Heads* ½-¾ in. in diam., solitary, rarely in pairs, shortly peduncled. *Involbracts* elliptic, obtuse, densely hairy. *Achenes* ⅒ in. long, glandular. *Pappus* a short fimbriate tube.

A common weed within the area. Flowers during the greater part of the year. DISTRIB. Throughout India in the plains from the Punjab eastwards and southwards, extending to China and to Trop. and Sub-Trop. Africa. The leaves are valued for their anodyne properties.

9. ERIGERON, Linn.; Fl. Brit. Ind. iii, 254.

Annual or perennial herbs. *Leaves* entire or toothed, cauline alternate. *Heads* solitary, corymbose or panicled, heterogamous, rayed or subdiciform. *Flowers* of the ray female, del 2-many-seriate, fertile; those of the disk 2-sexual, usually all fertile. *Involucre* hemispheric or campanulate; *bracts* many, in 2 series, narrow, somewhat unequal. *Receptacle* flat, usually naked. *Anther-bases* obtuse. *Style-arms* of herm. flowers flattened, the tips lanceolate. *Achenes* compressed, usually narrow, the faces with or without nerves. *Pappus* very slender, often double, the outer row of a few short hairs or bristles.—Species about 100, chiefly in temperate regions of the world.

Leaves narrowly linear or linear-lanceolate, entire or minutely toothed	1. *E. canadensis.*
Leaves obovate or oblong, toothed or lobulate.	2. *E. asteroides.*

1. E. canadensis, *Linn. Sp. Pl. 863; F. B. I. iii, 254.*

An erect much-branched annual, up to 3 ft. high, pubescent or nearly glabrous, branches very slender. *Leaves* 1-3 in., narrowly linear or linear-lanceolate, acuminate, entire or remotely toothed, glabrous or pilose. *Heads* ¼-¼ in. in diam., pedunculed in elongate branched panicles. *Invol-bracts* narrowly lanceolate, acuminate, glabrous or pilose outside, margins scarious. *Ligules* pale rose or purplish, scarcely exceeding the pappus. *Achenes* ⅟₁₀ in., narrow, flat, glabrous. *Pappus* almost white, turning reddish.

Often met with on waste ground and on the borders of cultivation. DISTRIB. Punjab plain, and on the Western Himalaya up to 3,000 ft. It occurs in all warm countries, and is believed to be indigenous in N. America.

2. E. asteroides, *Roxb. Fl. Ind. iii, 432; F. B. I. iii, 254; Watt E. D.; Cooke Fl. Bomb. ii, 17.*

A coarse pubescent or villous annual, 1-2 ft. high. *Stem* branched, erect or sometimes decumbent, clothed with long spreading hairs and viscid glands. Radical *leaves* obovate shortly petioled; cauline ½-1 in. long, obovate or oblong, ½-amplexicaul, all coarsely toothed or lobulate, hairy on both sides. *Heads* ¼-½ in. in diam., pedunculed, solitary or sub-corymbose. *Invol-bracts* 1-2-seriate, very narrow, bristle-pointed, much shorter than the pappus, margins scarious. *Ligules* capillary, violet-blue. *Flowers* of disk yellow. *Achenes* very minute, compressed, margined, nearly glabrous. *Pappus* grey or reddish.

Dehra Dun and Sub-Himalayan tract of Rohilkhand, also in Bundelkhand (Edgeworth). Flowers after the rainy season. DISTRIB. From the Punjab plain and Bengal to Bombay, S. India, and Ceylon, ascending to 4,000 ft. on the Sikkim Himalaya. This plant is liable to be mistaken for *Conyza aegyptiaca*, to which it bears a very close external resemblance.

10. CONYZA, Less.; Fl. Brit. Ind. iii, 257.

Herbs. *Leaves* alternate, entire, toothed or cut. *Heads* corymbose or panicled, rarely solitary, heterogamous, disciform; outer-fl. female, 2-many-seriate, filiform, rarely ligulate, 2-3-toothed, fertile; inner hermaph., all or mostly fertile, yellow, tubular, limb 5-toothed. *Involucre* campanulate; *bracts* 2-many-seriate, narrow (except in *C. rufa*), outer smaller. *Receptacle* flat or convex, naked or pitted and fimbriate. *Anther-bases* obtuse, entire. *Style-arms* of fem. flowers flattened, tips long or short. *Achenes* minute, compressed. *Pappus* slender, 1-seriate.—Species about 50, chiefly tropical and subtropical.

Involucre-bracts narrow.

Heads ⅛ in. diam., arranged in sparingly branched corymbs.	
Leaves serrate or the upper sometimes entire	1. *C. japonica.*
Leaves pinnatifidly lobed	2. *C. ægyptiaca.*
Heads ¼ in. diam., in much branched corymbs.—A tall gland-pubescent herb	3. *C. viscidula.*
Heads ⅛ in. diam., stems very leafy and fastigiately branched above	4. *C. stricta.*
Involucre-bracts ovate, acute, with broad well-defined scarious margins	5. *C. rufa.*

1. C. japonica, *Less. Syn. Comp. 204; F. B. I. iii, 258; Collett Fl. Siml. 252.*

An erect villous or woolly rarely glabrate annual, 6-15 in. high. *Stem* terete, often simple. Lower *leaves* subsessile, often crowded, 1-3 in. long or sometimes with much larger radical leaves, obovate spathulate or lanceolate, coarsely serrate or crenate; the upper ones sessile, ½-amplexicaul, oblong or ovate-oblong, often entire. *Heads* ⅛ in. in diam., globose, arranged in rather dense terminal corymbs. *Involbracts* narrowly lanceolate, acute, with scarious margins. *Achenes* $\frac{1}{12}$ in., margined, glabrous or very minutely pubescent. *Pappus* ⅛ in., at length reddish.

Dehra Dun (King). Flowers during May and June. DISTRIB. Punjab plain, and on the Himalaya up to 7,000 ft. from Simla eastwards and on the Khasia Mountains; Nilgiri Hills, Pegu, and Martaban; also in Afghanistan, China, and Japan and the Philippines.

2. C. ægyptiaca, *Dryand. in Ait. Hort. Kew. ed. I. iii, 183; F. B. I. iii, 258.*

An erect hirsute herb 1-2 ft. high. *Stem* stout and rather woody below, densely clothed with spreading hairs. *Leaves* 1½-3 in. long, lanceolate or obovate-lanceolate, unequally pinnatifidly lobed, pilose and hispid on both surfaces. *Invol-bracts* narrowly lanceolate, acuminate, hispid outside and with scarious margins. *Achenes* $\frac{1}{10}$ in., slightly margined and sparingly hairy. *Pappus* ⅛ in., reddish.

Dehra Dun and in the Sub-Himalayan tract of Rohilkhand. Flowers during April and May. DISTRIB. Tropical W. Himalaya in Garhwal and Kumaon, and on the Nilgiri Hills; also in Africa, China, Japan, and Australia. This plant may at once be distinguished from *C. japonica* by the more deeply cut leaves and the larger heads. It might be mistaken for *Erigeron asteroides*, but the outer flowers of the heads are not ligulate.

3. **C. viscidula,** *Wall. Cat. 3006; F. B. I. iii, 258; Collett Fl. Siml. 252.* C. polycephala, *Edgew. in Trans. Linn. Soc. xx, 66.*

A tall gland-pubescent herb. *Stems* 2-4 ft. high, terete, corymbosely branched, glabrous below, viscidly puberulous above. *Leaves* subsessile, 2-4 in. long, lanceolate, narrowed at both ends, entire or serrate, viscid-puberulous on both surfaces. *Heads* ½ in. in diam., pedunculed, arranged in large loose corymbs. *Involucral-bracts* lanceolate, acuminate, margins scarious. *Achenes* 2½ in. long, obovoid, margined, glabrous or very minutely hairy. *Pappus* ½-¼ in., reddish.

Dehra Dun and Siwalik range and throughout the Sub-Himalayan tracts of Rohilkhand and N. Oudh. DISTRIB. Sub-tropical Himalaya from Simla eastward to Sikkim and Manipur ascending to 4,000 ft.; also in S. India and Ceylon, Burma, Philippines, Java, New Caledonia, and Australia.

4. **C. stricta,** *Willd. Sp. Pl. iii, 1922; F. B. I. iii, 258; Collett Fl. Siml. 252; Cooke Fl. Bomb. ii. 17.* C. pinnatifida, *Roxb.; Fl. Ind. iii, 430.*

An erect hoary or roughly pubescent herb, 1-2½ ft. high. *Stems* leafy and excessively corymbosely branched above. *Leaves* subsessile, ½-2 in. long, narrowly linear to spathulate-obovate, entire or toothed, rarely pinnatifid, hairy. *Heads* ½ in. in diam., very numerous, pedunculed, corymbose, occasionally minutely ligulate. *Involucral-bracts* narrowly lanceolate. *Achenes* very small, narrowly elliptic, compressed, minutely puberulous or papillose. *Pappus* 1/8 in., reddish.

Dehra Dun and Siwalik range. DISTRIB. Outer Himalayan ranges up to 6,000 ft. from Hazara eastwards, and on the Khasia Mountains; also on the hills of C. and S. India and in Burma, extending to E. Africa.

5. **C. rufa,** *Wall. Cat. 3079; F. B. I. iii, 259.* C. marginata, *Edgew. in Trans. Linn. Soc. xx, 67.*

A tomentose or villous annual, corymbosely branched from the base; branches 4-10 in. long, spreading or prostrate. *Leaves* sessile, 1-2 in. long, oblong-obovate or linear-oblong, coarsely toothed. *Heads* subglobose, ¼ in. in diam., arranged in dense corymbs. *Involucral-bracts* broadly ovate, acute, green with broad well-defined membranous margins. *Achenes* 3/16 in., oblong, compressed, minutely pilose. *Pappus* ¼ in., reddish, shining, caducous.

Dehra Dun (Herb. Saharanpur), Moradabad (T. Thomson). Flowers in March and April. DISTRIB. Punjab at Ludhiana.

11. THESPIS, DC.; Fl. Brit. Ind. iii, 259.

A branched glabrous annual. *Leaves* alternate, toothed. *Heads* minute, globose, sessile in globose clusters on the branches of dichotomous cymes, heterogamous, disciform, yellow. *Outer fl.* fem.

many-seriate, often without corolla, fertile. *Disk-fl.* hermaph., few, regular, sterile, tube very short, limb narrowly campanulate, 4-fid. *Involucre* hemispheric; *bracts* sub-2-seriate, broad, acute, with membranous margins. *Receptacle* flat or convex, naked. *Anther-bases* obtuse, entire or 2-fid. *Style-arms* short, flattened, subacute. *Achenes* of fem. fl. small, hardly ribbed. *Pappus-hairs* about 10, short, dilated.—A single species.

T. divaricata, *DC. Prod. v. 375; F.-B. I. iii, 259.*

Glabrous or sparsely setulose. *Stem* simple or with many spreading branches from the base, 3 in. to 2 ft high. *Leaves* ½-1½ in. long, sessile or narrowed into a petiole, lowermost rounded or obovate, cauline spathulate, all sharply serrate towards the apex. *Heads* ½ in. in diam. *Invol-bracts* ovate, obtuse, with 3 distinct reddish nerves, the margins membranous. *Achenes* very small, slightly margined, minutely papillose. Sub-Himalayan tracts of Rohilkhand, N. Oudh, and Gorakhpur (Duthie's collector). Flowers in May. DISTRIB. Trop. Himalaya from Nepal to Sikkim also on the Khasia Hills, in E. Bengal, and Burma, extending to Tonkin.

12. BLUMEA, DC.; Fl. Brit. Ind. iii, 260.

Annual or perennial glandular-pubescent or woolly herbs. *Leaves* alternate, usually toothed or lobed. *Heads* corymbose panicled or fascicled, rarely racemed, heterogamous, disciform, purple rosy or yellow. Outer fl. many-seriate, fem., fertile, filiform, 2-3-toothed. *Disk-fl.* hermaph., few, fertile, tubular, slender; limb 5-toothed. *Involucre* ovoid or campanulate; *bracts* many-seriate, narrow, acute, soft or herbaceous, outer smaller. *Receptacle* flat, naked. *Anther-bases* sagittate; tails small, slender. *Style-arms* of hermaph. fl. flattened or almost filiform, obtuse or acute, rarely connate. *Achenes* small, subterete or angled, ribbed or not. *Pappus* 1-seriate, slender, often caducous.—Species about 60, in tropical and subtropical Asia, Africa, and Australia.

Heads on long slender peduncles, solitary or few and corymbose; receptacle glabrous.

Heads all solitary.

Leaves dentate, all alternate; pappus pink. . . . . 1. *B. amplectens.*

Leaves serrate, the uppermost opp.; pappus white. . . . . 2. *B. bifoliata.*

Heads few, in axillary and terminal corymbs; leaves very acutely toothed.
- An erect herb . . . . . 3. *B. eriantha.*
- A prostrate or decumbent herb . . 4. *B. oxyodonta.*

Heads many, arranged in spiciform cymes or panicles.
- Corolla purple, receptacle glabrous; achenes hairy, not ribbed . . . 5. *B. Wightiana.*
- Corolla yellow.
  - Receptacle pubescent, achenes ribbed, glabrous or nearly so, involucr-bracts purplish . . . . . 6. *B. glomerata.*
  - Receptacle glabrous; achenes not ribbed, glabrous. Whole plant strongly turpentine-scented . . 7. *B. lacera.*
  - Receptacle glabrous; achenes ribbed, hairy; stems often scape-like . 8. *B. hieracifolia.*

Heads many, in peduncled open corymbs or panicles; corolla yellow; achenes ribbed, silky—
- Stem branching from the base, lower leaves runcinate lyrate or subpinnatifid.
  - Upper leaves few, large, laciniate; receptacle pubescent . . . 9. *B. laciniata.*
  - Upper leaves many, rather small, toothed; receptacle glabrous . . 10. *B. membranacea.*
- Stem branched above, simple below; lower leaves obovate, lanceolate, coarsely serrate; involucr-bracts purplish; receptacle pubescent . . . . . 11. *B. Jacquemontii.*

Heads very numerous, ¼-½ in. in diam., arranged in term. corymbs or panicles; receptacle glabrous.—Shrubby herbs with large leaves.
- Leaves with narrow cordate bases, pappus white . . . . . 12. *B. procera.*
- Leaves not cordate at base, pappus reddish. Plant strongly aromatic . . . 13. *B. aromatica.*

1. B. amplectens, *DC. in Wight Contrib. Bot. 13; F. B. I. iii, 260; Cooke Fl. Bomb. ii, 19.*

A bush-like herb up to 1 ft. high, usually softly hairy, branches spreading from the base. *Leaves* sessile and ½-amplexicaul, all alternate, ½-1½ in. long, oblong or obovate, obtuse or acute, dentate or the upper

ones often entire. *Heads* on long slender peduncles, solitary, ¼-½ in. in diam. *Involucral-bracts* very slender, densely pubescent, the inner ones bristle-tipped. *Receptacle* glabrous. *Flowers* yellow; corolla-lobes of herm. fl. hairy. *Achenes* minute, oblong. *Pappus* pink.

A common weed within the area, especially in sandy ground. Flowers March to June. DISTRIB. Central and S. India to Ceylon. Of the five varieties mentioned in the Flora of Brit. India the two following occur within the area of this flora.

VAR. 1. arenaria. B. arenaria. *DC.* Differs from the type by the sparingly toothed leaves which are densely villous beneath.—Bundelkhand. DISTRIB. Southwards through Deccan to Ceylon.

VAR. 2. pubiflora. B. pubiflora, *DC.* This has stout hairy peduncles, and much larger flowers than in the type. When dried it is not easily distinguished from *Erigeron asteroides.*—N. Oudh and Bundelkhand. DISTRIB. Extends to S. India.

2. B. bifoliata, *DC. in Wight Contrib. 14; F. B. I. iii, 261; Cooke Fl. Bomb. ii, 19. Conyza bifoliata, Willd.; Roxb. Fl. Ind. iii, 430.*

A bush-like herb up to 2 ft. high. *Stems* branching from the base, erect or decumbent, more or less hairy. *Leaves* sessile or nearly so, 1-3 in. long, obovate-oblong, obtuse or acute, serrate, the 2 uppermost on each branch subopposite. *Heads* ½-¾ in. in diam., solitary on long peduncles. *Involucral-bracts* more or less villous, acute, not caudate. *Receptacle* glabrous. *Flowers* yellow; lobes of herm. corolla hairy. *Achenes* narrowly oblong, 4-5-angled, not ribbed. *Pappus* white.

In the Sub-Himalayan tracts of Rohilkhand and N. Oudh, also in Bundelkhand. DISTRIB. Bengal, C. and S. India to Ceylon and Malay Peninsula.

3. B. eriantha, *DC. in Wight Contrib. 15; F. B. I. iii, 266; Watt. E.D.; Cooke Fl. Bomb. ii, 22.*

A pubescent dichotomously branched herb, 1 ft. or more high. *Stem* erect, terete, subglabrous below. *Leaves* all alternate, 1-3 in. long, submembranous and softly pubescent, the lower petioled, obovate or oblanceolate, acute or acuminate, margined with unequal mucronate teeth; upper smaller, acute or acuminate often, entire. *Heads* ¼-½ in., on the long slender silky peduncles of dichotomous cymes. *Involucral-bracts* clothed with long silky hairs. *Receptacle* glabrous. *Corolla-lobes* of herm. flowers hairy. *Achenes* very minute; obtusely angled, sparingly silky.

Bundelkhand (Edgeworth). Flowers during the cold season. DISTRIB. Konkan and Deccan.

4. B. oxyodonta, *DC. in Wight Contrib. 15; Royle Ill. 248; Clarke Comp. Ind. 45; F. B. I. iii, 266; Cooke Fl. Bomb. 21.* B. bovina, *Edgew. in Journ. As. Soc. Beng. xxi, 173.*

A prostrate or decumbent herb, pubescent villous or tomentose. *Branches* spreading from the root, slender, simple or dichotomously forked.

Leaves all alternate, spinulose-toothed, often clothed with white silky hairs when young; lower petioled, 2-4 in. long, obovate membranous; upper sessile, much smaller, obovate or oblong. *Heads* ½ in. in diam., on slender peduncles, solitary or few in a corymb. *Involucral-bracts* linear-lanceolate, acute, usually woolly. *Receptacle* glabrous. *Corolla-lobes* of herm. flowers glabrous. *Achenes* sparingly silky.

Fairly common within the area, especially in the Sub-Himalayan tracts, and in Bundelkhand and Merwara. Flowers from March to May. DISTRIB. Trop. Himalaya from Garhwal to Nepal, Bengal, C. Prov. and the Deccan; extending to Burma, China and the Philippines. This species, though somewhat variable, may generally be recognized by its prostrate habit. Kurz was inclined to regard it as a hybrid or polygamous form of some other species. Both Edgeworth and Mr. C. B. Clarke have searched in vain for fertile anthers.

5. **B. Wightiana,** *DC. in Wight Contrib. 14; Royle Ill. 243; F. B. I. iii, 261; Cooke Fl. Bomb. ii, 19.*

An erect villous herb, rarely viscid-glandular. *Stem* 10-24 in. high, sub-simple, very leafy. *Leaves* petioled, 1½-2 in. long, ovate obovate or lanceolate, irregularly dentate or serrate. *Heads* many, ¼ in. in diam., arranged in terminal or axillary spike-like cymes or panicles. Outer *involucral-bracts* few, short, narrow, acuminate, inner many. *Receptacle* glabrous. *Corolla* purple; the lobes (in the hermaphrodite florets) glandular. *Achenes* terete or 4-5-angled, not ribbed, sparsely hairy.

A very common weed within the area, flowering from Feb. to May. DISTRIB. Throughout India from the outer Himalaya to S. India and Ceylon, Burma and Malaya; also in China, Australia, and Trop. Africa. The small heads of purplish flowers and the more hairy achenes distinguish this species from *B. lacera.*

6. **B. glomerata,** *DC. in Wight Contrib. 15; F. B. I. iii, 262; Cooke Fl. Bomb. ii, 20.* Conyza fistulosa, *Roxb. Fl. Ind. iii, 429.*

A pubescent or villous herb. *Stem* erect, slender, 1-3 ft. high, slender, hollow. Lower *leaves* petioled, obovate, serrate or sometimes lyrate-pinnatifid: upper oblong, incised. *Heads* ¼ in. in diam., arranged in small sessile axillary clusters on the slender erect branches. *Involucral-bracts* purplish, subulate-lanceolate, villous. *Receptacle* pubescent. *Corolla* yellow, the lobes (in the herm. florets) pubescent. *Achenes* 8-10-ribbed, glabrous or sparsely pubescent.

Dehra Dun (Edgeworth), near Patna (Madden). DISTRIB. Eastwards to Bengal, Assam, and Burma, ascending to 5,000 ft. on the Himalaya between Garhwal and Sikkim, and southwards through Central to S. India; also in China, Java, and the Phillippines. The clusters of purple sessile heads often become spiciform.

7. **B. lacera,** *DC. in Wight Contrib. 14; F. B. I. iii, 263; Watt E. D.; Cooke Fl. Bomb. ii, 20.* Conyza lacera, *Roxb. Fl. Ind. iii, 423.* B. fontina-

lis, *Edgew. in Journ. As. Soc. Beng. xxi, 173.* Conyza lacera, *Roxb. Fl. Ind. iii, 428.*

An erect annual 1-3 ft. high, usually glandular-pubescent and with a strong scent of turpentine. *Stem* simple or branched, very leafy. *Leaves* sessile or the lower petioled, oval or obovate, dentate or serrate, rarely lobulate, silky on both surfaces. *Heads* ¼ in., in short axillary cymes or collected into terminal spiciform panicles, rarely corymbose. *Involucral-bracts* linear-lanceolate, acuminate, villous and glandular-hairy. *Receptacle* glabrous. *Florets* yellow, the lobes of herm. corollas nearly glabrous. *Achenes* sub 4-gonous, not ribbed, glabrate.

Abundant over the whole area, flowering from Feb. to June. DISTRIB. Throughout the plains of India and in Ceylon, extending to the Malay Peninsula and Islands, China, Trop. Africa, and Australia. Very similar to *B. Wightiana* and, like it, extremely variable, but the florets of the latter are purple, and it has not the odour of turpentine.

8. B. hieracifolia, *DC. in Wight Contrib. 15; F. B. I. iii, 263* Erigeron hieracifolium, *Don. Prod. 172.*

A tomentose villous or copiously woolly herb, rarely glabrate. *Stem* usually rather robust, simple or paniculately branched above, or, in small plants, scapelike. *Leaves* very variable as to size and shape, the lower ones usually stalked, elliptic or obovate, dentate or serrate; upper sessile and often entire, usually densely clothed beneath with white or brownish silky hairs. *Heads* ¼-⅔ in. in diam., more or less fascicled or in spikes and forming elongate panicles, rarely corymbose. *Involucral-bracts* lanceolate, acuminate, the outer tinged with purple and very villous. *Receptacle* glabrous. *Florets* yellow; corolla-lobes of herm. florets glabrate. *Achenes* strongly ribbed, densely villous.

Throughout the hilly parts of India, from the outer Himalaya eastwards to Burma and southwards to S. India; also in China and Java. I have seen no specimens of the typical form from the upper Gangetic Plain, but the two following varieties are recorded from this area.

VAR. 1. Hamiltonii, *F. B. I. l.c.* B. Hamiltonii, *DC. Stems* up to 18 in. high, often clothed with white or buff-coloured tomentum. *Leaves* chiefly radical, villously silky beneath. *Heads* in spiked fascicles.—Chiefly in the Sub-Himalayan tracts from Garhwal eastwards, ascending to 5,000 ft., abundant in N. Oudh.

VAR. 2. macrostachya, *F. B. I. l.c.* B. macrostachya *DC.*—*Stem* tall and robust, paniculately branched above. *Leaves* densely clothed beneath with spreading silky hairs. *Heads* in large clusters at the ends of the branches.—Dehra Dun (Gamble). DISTRIB. From Kumaon eastward to Bengal and Manipur. This may, as Clarke suggests, prove to be specifically distinct.

9. B. laciniata, *DC. Prod. v, 436; F. B. I. iii, 264.* Conyza laciniata, *Roxb. Fl. Ind. iii, 427.*

A tall erect herb, pubescent or laxly grey-tomentose. *Stem* 2-5 ft. high, usually stout, corymbosely branched above. *Leaves* runcinate lyrate or

sub-pinnatifid and toothed, membranous, hairy on both sides; the lower ones often very large. *Heads* ½ in. in diam., in broad open corymbs or more or less congested. *Involucre-bracts* lanceolate, acuminate, villous on the back, often tinged with purple. *Receptacle* hairy. *Florets* yellow; lobes of herm. corolla hairy. *Achenes* 8-10-ribbed, silky.

Abundant within the area. Flowers during the early part of the year. DISTRIB. Trop. Himalaya from the Punjab eastwards to Sikkim; also in Assam, and in C. and S. India, extending to Malaya, China and the Philippines. Roxburgh says that it differs from *B. lacera* in having all the leaves laciniate. It is also scentless.

10. B. membranacea, *DC. Prod. v, 440; F. B. I. iii, 265; Cooke Fl. Bomb. ii, 21.* Conyza diffusa, *Roxb. Fl. Ind. iii, 429.*

A slender more or less glandular-pubescent annual. *Stems* 2-4 ft. high, usually much branched from the base. *Leaves* thinly membranous; the lower petioled, up to 5½ in. long, obovate lyrate or runcinate, tapering downwards into the winged petiole, coarsely serrate or dentate, pubescent on both surfaces; upper small, numerous. *Heads* many, about ¼ in. in diam., on slender viscid peduncles, arranged in much branched open panicles. *Involucre-bracts* very slender, pubescent. *Receptacle* glabrous. *Florets* yellow; lobes of herm. corolla glandular. *Achenes* 8-10-ribbed, hairy.

Dehra Dun and Siwalik range. DISTRIB. Throughout India and in Ceylon, extending to Malaya. A common and very variable weed.

11. B. Jacquemontii, *Hook. f. in F. B. I. iii, 265.*

A large coarse herb. *Stem* stout, erect, simple below, clothed with soft spreading hairs. *Leaves* 3-5 in. long, villous on both sides, the lower petioled, obovate-lanceolate, coarsely and irregularly serrate; the upper sessile, acutely serrate or lacerate. *Heads* ½ in. in diam., pedunculed on the spreading branches of corymbs forming a large open paniole. *Involucre-bracts* many, erect, subulate-lanceolate, rigid, puberulous, often tinged with purple; the inner ones much longer. *Receptacle* scabrid. *Corolla* yellow. *Achenes* 8-10-ribbed, silky.

Found by Vicary at Sangor near the southern boundary of the area. Flowers in April. DISTRIB. Parasnath in Behar, Nilgiris. The inflorescence is usually very broad, and the involucre much resembles that of a *Vernonia*.

12. B. procera, *DC. Prod. v, 445; F. B. I. iii, 268.* Conyza repanda, *Roxb. Fl. Ind. iii, 431.*

A large shrub-like herb up to 6 ft. in height. *Stem* villous or tomentose above; branches long and stout. *Leaves* 5-8 in. long, obovate-oblong or obovate-lanceolate, acuminate, narrowly cordate-amplexicaul at the base, coarsely and irregularly toothed, under surface of lower leaves usually glabrous, of the upper ones more or less villous or tomentose. *Heads* ½ in. in diam., usually in dense clusters on the woolly branches

of an elongate panicle. *Invol-bracts* silky; outer short, acute, coriaceous. *Receptacle* glabrous. *Flowers* yellow; lobes of herm. corolla very hairy. *Achenes* ribbed, silky. *Pappus* white.

Dehra Dun, in shady ravines (Gamble). DISTRIB. Trop. Himalaya, from Garhwal eastwards to Sikkim, and on the Khasia Hills, up to 5,000 ft., also in Burma.

13. B. aromatica, *DC. Prod. v, 446; F. B. I. iii, 270.*

A glandular and very aromatic shrub-like herb. *Stem* stout, 3-8 ft. high. *Leaves* 6-12 in. long obovate-oblong or obovate-lanceolate, serrate or coarsely dentate or lobulate, membranous, glabrous or villous beneath, the lower ones narrowed towards the base into a broadly winged or appendaged petiole; upper sessile. *Heads* ½-¼ in. in diam., pedicelled or sessile and arranged in clusters on the branches of a large panicle. *Invol-bracts* gland-puberulous, the outer broader at the base and much shorter. *Receptacle* glabrous. *Flowers* yellow; corolla-lobes glandular. *Achenes* 10-ribbed, hairy. *Pappus* reddish.

Dehra Dun (Falconer, Gamble), also in the Sub-Himalayan tract of Rohilkhand. Flowers during April and May. DISTRIB. Trop. Himalaya from Garhwal eastwards to Sikkim, and on the Khasia Hills, ascending to 5,000 ft., extending to Burma and China.

13. LAGGERA, Sch. Bip.; Fl. Brit. Ind. iii, 270.

Annual or perennial herbs. *Leaves* alternate, often rigid and decurrent. *Heads* panicled or axillary, heterogamous, disciform. *Outer flowers* female, many-seriate, fertile, filiform, mouth minutely toothed. *Disk-fl.* hermaphrodite, many-seriate, fertile, tubular, limb 5-fid. *Involucre* companulate; *bracts* many-seriate, narrow, often rigid, outer shorter. *Receptacle* flat, naked. *Anther-bases* 2-lobed or sagittate; auricles obtuse or acute, often unequal, not tailed nor connate with the adjoining anthers. *Style-arms* of herm. flowers and pappus as in *Blumea.*—Species 10, in Trop. Africa and India.

Stem 4-winged, flowers purplish . . .	1. *L. alata.*
Stem cylindrical.	
Leaves shortly decurrent, flowers pink. .	2. *L. aurita.*
Leaves not decurrent, flowers yellow . .	3. *L. flava.*

1. L. alata, *Schultz-Bip. ex Oliv. in Trans. Linn. Soc. xxix, 94; F. B. I. iii, 271; Collett Fl. Siml. 253; Cooke Fl. Bomb. ii, 24.* Conyza alata, *Roxb.; Fl. Ind. iii. 430.* Erigeron alatum, *Don Prod. 171.*

A robust much-branched leafy perennial herb, pubescent or tomentose and sometimes glandular. *Stems* 2-4 ft., with broad entire

wings. *Leaves* sessile, 1-4 in. long, narrowly oblong, acute, denticulate or subentire, rough above, woolly beneath, decurrent on the stem at their base. *Heads* ¼ in. in diam., racemed on the winged axillary branches, nodding in fruit. *Involucral-bracts* many; outer short, herbaceous, often recurved, inner longer and straight. *Flowers* purplish, corolla of outer slender. *Achenes* appressedly hairy. *Pappus* white. Dehra Dun and Siwalik range. Flowers in Oct. DISTRIB. Trop. Himalaya up to 5,000 ft. from Simla to Sikkim and in the hilly districts of Central and S. India to Ceylon and Burma; also in Trop Africa, Madagascar, China, Java, and the Philippines.

2. **L. aurita**, *Schultz-Bip. ex Clarke Comp. Ind. 82; F. B. I. iii, 271; Watt E. D.; Cooke Fl. Bomb. ii, 24.* Conyza aurita, *L. f.; Roxb. Fl. Ind. iii, 428.*

A perennial herb, viscidly pubescent or villous. *Stem* up to 2 ft. high, erect, cylindrical, not winged. *Leaves* sessile or petioled, 2-4 in. long on the main stem, the upper smaller and bractlike, oblanceolate, subacute, toothed lobed or ½-pinnatifid, shortly decurrent. *Heads* ½-¾ in. in diam., arranged in terminal panicled corymbs. *Involucral-bracts* slender, linear, acute, softly villous; inner longer, scarious. *Receptacle* glabrous. *Flowers* pink. *Achenes* hairy, dark red.

Abundant within the area. Flowers in Feb. and March. DISTRIB. From the Punjab plain and Bengal south to Travancore, eastward to Chittagong and Burma, extending to Trop. Africa. The whole plant smells strongly of turpentine.

3. **L. flava**, *Benth & Hook. f. Gen. Pl. ii, 290; F. B. I. iii, 270; Collett Fl. Siml. 253.* Erigeron falcatum, *Don Prod. 172.*

A slender glabrous or puberulous herb 6 in. to 3 ft. high. *Stem* simple or corymbosely branched above, sulcate. *Leaves* 1-3 in. long, lower petioled; cauline ½-amplexicaul, ovate-lanceolate or obovate, sharply dentate or incised or sometimes almost entire, membranous, glabrous or subscabrous. *Heads* few, ¼ in. in diam., on the slender branches of loose panicled cymes. Outer *involucral-bracts* ovate, acute; inner longer, lanceolate, acuminate, all glabrous or with ciliate margins. *Receptacle* glabrous. *Flowers* golden-yellow; lobes of herm. corolla glabrous. *Anthers* sagittate. *Achenes* very minute, glabrous. *Pappus* white.

Siwalik range (Falconer, Gamble), forest-tracts in N. Oudh (Hearle, Duthie). Flowers during the cold season. DISTRIB. Outer Himalaya up to 6,000 ft. from Garhwal to Sikkim and Bhutan and in the hilly parts of Bengal, Central and S. India; also in Burma and in the Malay Peninsula.

14. PLUCHEA, Cass.; Fl. Brit. Ind. iii, 271.

Shrubs rarely herbs, tomentose or glutinous. *Leaves* alternate. *Heads* small, in terminal leafless corymbs, or large and subsolitary, heterogamous, disciform, white, yellow or lilac. *Outer flowers*

female, many-seriate, fertile, filiform. *Disk-flowers* herm., few, sterile, tubular, limb 5-fid. *Involucre* ovoid or campanulate; *bracts* ovate, usually broad, dry, rigid. *Receptacle* flat, naked, *Anther-bases* sagittate, cells tailed. *Style-arms* of herm. flowers filiform, entire or 2-fid. *Achenes* small, 4-5-angled. *Pappus-hairs* slender, 1-seriate, rigid, free, or achenes many and connate in the sterile flowers.—Species about 30, tropical and sub-tropical.

Leaves broadly ovate or obovate, incised serrate	1. *P. tomentosa.*
Leaves coriaceous, oblong or oblanceolate, entire or toothed near the apex . .	2. *P. lanceolata.*

1. P. tomentosa, *DC. in Wight Contrib. 16; F. B. I. iii, 272; Cooke Fl. Bomb. ii, 25.*

A small more or less tomentose or glandular-pubescent shrub up to 5 ft. high. *Leaves* sessile, 1½-2 in. long, broadly ovate or obovate, acute or obtuse, subamplexicaul and often auricled at the base or sub-decurrent, coarsely toothed, softly pubescent beneath. *Heads* about ½ in., in diam., many, arranged in compound terminal corymbs. Outer *invol-bracts* short, ovate, acute; inner linear-oblong, acute, ciliate at the apex. *Receptacle* glabrous. *Achenes* obscurely angled. *Pappus* reddish.

Dehra Dun (T. Thomson), Banks of the Ganges from Fatehgarh to Cawnpore (Madden). Flowers in Dec. DISTRIB. Sind, Bombay, C. India to Travancore.

2. P. lanceolata, *C. B. Clarke Comp. Ind. 94; F. B. I. iii, 272; Watt E. D.; Cooke Fl. Bomb. ii, 26.*—Vern. *Banserai* (Aligarh), *choti kalia* (Agra), *sorahi* (Cawnpore).

A small hoary-pubescent shrub with erect rather slender branches. *Leaves* coriaceous, sessile, 1-2 in., oblong or oblanceolate, narrowed to the base, entire or toothed round the apex, minutely pilose, pale when dry; nerves very oblique, prominent on both surfaces. *Heads* in compound corymbs, longer than broad. *Involucre* contracted at the mouth; outer *bracts* short, very obtuse, hoary, usually tinged with purple; inner few, linear, subacute. *Achenes* minute. *Pappus*-hairs connate at the base.

Doab tract, especially in sandy or saline soil, also in the Ajmere district and in certain parts of Rajputana. Flowers during the cold season DISTRIB. Plains of Punjab and Sind. A very troublesome weed in cultivated ground owing to its deeply penetrating vigorous roots. The leaves are sometimes used medicinally.

15. SPHÆRANTHUS, Linn.; Fl. Brit. Ind. iii, 274.

Low annuals with spreading branches. *Leaves* alternate, toothed, decurrent. *Heads* small, in terminal solitary globose clusters, which

are usually involucrate by a few empty bracts, sessile on a common receptacle and bracteate or not, heterogamous, disciform. *Outer-flowers* female, few or many, fertile, slender, minutely 2-3-toothed. *Disk-flowers* hermaphrodite, solitary or few, fertile or sterile, tube thickened, limb 4-5 toothed. *Involucre* narrow; *bracts* narrow, acute, dry, unequal. *Receptacle* small, naked. *Anther-bases* sagittate, auricles acute or tailed. *Style-arms* of herm. flowers filiform or connate. *Achenes* oblong, subcompressed. *Pappus* 0. Species 8, in Trop. Asia, Africa, and Australia.

S. indicus, *Linn. Sp. Pl. 927; Royle Ill. 248; F. B. I. iii, 275; Watt, E. D.; Collett Fl. Simi. 254; Cooke Fl. Bomb. ii, 28.* S. mollis, *Roxb.; Fl. Ind. iii, 446.*

A much-branched glandular-hairy herb, about 1-2 ft. high. *Branches* ascending, winged with the toothed bases of the decurrent leaves. *Leaves* sessile, 1-2 in. long, obovate-oblong, narrowed to the base, obtuse or subacute, dentate or serrate, the teeth often bristle-pointed, glandular and hairy on both sides. Clusters of *heads* ⅜-½ in. in diam., globose or shortly oblong; wings of pubescent peduncles toothed. *Heads* many, densely packed. *Involucre-bracts* shorter than the heads, linear, ciliate at the apex. *Flowers* pink or purple. *Achenes* stalked, smooth.

Abundant all over the area, especially in damp ground. Flowers during the cold season. DISTRIB. Throughout India and in Ceylon, ascending to 5,000 ft. on the Himalaya; also in Malaya, China, Africa, and Australia. This plant, which has a strong aromatic odour, is used medicinally as a bitter tonic and also as a vermifuge.

16. FILAGO, Linn.; Fl. Brit. Ind. iii, 277.

Small woolly herbs. *Leaves* alternate. *Heads* small, sessile in crowded terminal and axillary clusters, which are often inclosed by floral leaves, heterogamous, disciform. *Outer-flowers* female, many-seriate, fertile, filiform, 2-3-toothed. *Disk-flowers* herm., few, fertile or not; limb scarcely dilated, 4-5 toothed. *Involucre-bracts* 2-many-seriate, scarious, inner gradually passing into the pales but shorter than these. *Receptacle* cylindric, obconic or flat and constricted at the base; pales at the base of the outer or of all the flowers hyaline, concave. *Anther-bases* sagittate; auricles small, tails short slender. *Style-arms* of herm. flowers oblong or linear, obtuse. *Achenes* minute, subterete or compressed, tip rounded, not ribbed. *Pappus* of inner fem. flowers and of the herm. flowers 1-2-seriate, slender, scabrid; of outer fem. flowers 0 or scanty.—Species about 8, natives of the Old World.

F. germanica, *Linn. Sp. Pl. Add. ed. II, 1311; F. B. I. iii, 277; Collett Fl. Siml. 254.* F. spathulata, Presl, var. prostrata, Parl. (sp. Gnaphalium hardwaricum, *Wall. Cat. 2951.*

An erect or prostrate woolly annual. *Stem* 2-6 in., long, simple or dichotomously branched from the base. *Leaves* sessile or petioled; about ½ in. long, obovate-oblong, apiculate. Clusters of *heads* sessile it the forks of the branches, ½-¾ in., in diam, surrounded by leaf-like bracts. *Heads* 6-20, ¼ in. long, yellowish, glistening. *Invol-bracts* erect in fruit, acuminate, scarious, outer awned. *Corolla* of outer florets very slender. *Achenes* rough.

Dehra Dun and Sub-Himalayan tracts of Rohilkhand. DISTRIB. Westwards through the plains of N. Punjab and the N. W. Frontier districts to Afghanistan and the Canary Islands, ascending to 8,000 ft. in Kashmir and W. Tibet.

17. IFLOGA, Cass.; Fl. Brit. Ind. iii, 277.

Herbs or small shrubs. *Leaves* alternate, small or slender, often clustered. *Heads* small, solitary or clustered, sessile, forming leafy spikes, heterogamous, disciform. *Outer-flowers* female, 1-many-seriate, fertile, very slender, obscurely toothed. *Disk-flowers* hermaphrodite, sterile, limb 5-toothed. *Invol-bracts* few. *Receptacle* cylindric below or slightly elevated; top flat, naked, with an outer ring of scarious pales as long as the bracts. *Anther-bases* sagittate, tails very slender. *Achenes* glabrous, of fem. flowers small, oblong. *Pappus* 0; of herm. flowers scanty, 1-seriate, feathery.—Species 8, one in India, the rest in N. Africa.

I. Fontanesii, *Cass. in Dict. Sc. Nat. xxiii, 14; F. B. I. iii, 277.*

A woolly or glabrate annual, branched from the base. *Branches* 4-6 in. long, ascending, densely leafy. *Leaves* spreading, narrowly linear, acute, margins involute. Clusters of *heads* ¼ in. long, sessile in the axils of the leaves throughout the length of the branches, reddish, glistening, glabrous. *Invol-bracts*, scarious, aristate. *Achenes* oblong, smooth. *Pappus* reddish.

Sub-Himalayan tract from Moradabad westwards. Flowers in Feb. DISTRIB. Punjab Plain and westward through Afghanistan to the Canaries.

18. GNAPHALIUM, Linn.; Fl. Brit. Ind. iii, 288.

Hoary or woolly herbs. *Leaves* alternate, quite entire. *Heads* small, in terminal or axillary corymbs or fascicles, heterogamous, disciform. *Flowers* all fertile; outer female, 2-many-seriate, filiform, 3-4-toothed; those of the disk hermaphrodite, fewer, slender, limb

dilated and 5-toothed. *Involucre* ovoid or campanulate; *bracts* many-seriate, all scarious or with a white yellow or brown more or less scarious blade. *Receptacle* naked or pitted. *Anther-bases* sagittate and with slender tails. *Style-arms* of herm. flowers truncate or capitate. *Achenes* oblong or obovoid, not ribbed. *Pappus-hairs* 1-seriate, slender or thickened at the tip, caducous, connate at the base or not. Species about 100, cosmopolitan.

Heads in corymbose leafless clusters . .	1. *G. luteo-album.*
Heads in leafy spikes.	
Pappus hairs not coherent at the base .	2. *G. indicum.*
Pappus hairs coherent at the base . .	3. *G. purpureum.*
Heads in rounded leafy axillary or terminal clusters	4. *G. pulvinatum.*

1. G. luteo-album, *Linn. Sp. Pl. 851; F. B. I. iii, 288; Watt E. D.; Collett Fl. Siml. 257; Cooke Fl. Bomb. ii, 30.* G. orixense and G. albo-luteum, *Roxb. Fl. Ind. iii, 425.*

A very variable more or less woolly annual, 4-18 in. high. *Stems* simple or corymbosely branched above. *Leaves* sessile, 1-2 in. long, rarely more than ¼ in. broad, oblong-spathulate, obtuse, usually woolly on both surfaces; upper lanceolate, acute, ½-amplexicaul. *Heads* leafless. whitish-yellow or brownish, arranged in dense corymbose glistening clusters. *Invol-bracts* oblong, obtuse, hyaline except near the base. *Achenes* papillose. *Pappus* shorter than the involucre.

The European type with pale straw-coloured heads has not been found east of Afghanistan. The two following varieties occur, however, abundantly within the area of this flora.

VAR. 1. multiceps, *Wall. (sp.)* *Heads* golden-yellow. Sub-Himalayan tracts from the Jumna eastwards, and in the hilly parts of Merwára and Bundelkhand. DISTRIB. Himalaya up to 10,000 ft., Mt. Abu in Rajputana, Upper Burma, Tenasserim extending to China and Japan.

VAR. 2. pallidum, *Buch.-Ham. (sp.)* *Heads* pale-brown. Common within the area and throughout India, extending to China and Japan and to most hot and warm temperate countries.

2. G. indicum, *Linn. Sp. Pl. 852; Royle Ill. 248; F. B. I. iii, 289; Cooke, Fl. Bomb. ii, 30.* G. strictum and multicaule, *Roxb. Fl. Ind. iii, 424, 425.*

A slender weed, more or less clothed with white wool. *Stems* 6-12 in. high, many from the root, ascending, leafy. *Leaves* ½-1½ in. long, linear-obovate or spathulate, apiculate, usually woolly on both surfaces; lower leaves shortly petioled. *Heads* ¼ in. in diam., in simple or branched leafy spikes or crowded into ovoid clusters. *Invol-bracts* linear-oblong, acute, pale reddish-brown or straw-coloured, the inner nearly glabrous. *Achenes* minutely papillose. *Pappus-hairs* not coherent at the base.

An abundant weed within the area, and throughout India on the plains, extending westwards to Senegal and eastwards to China, Japan and Australia. When growing in shade the upper surface of the leaves is usually more or less glabrous.

3. **G. purpureum,** *Linn. Sp. Pl. 854; F. B. I. iii, 289.*

Annual, sparsely cottony. *Stems* many from the root, 12-18 in. high, ascending. *Leaves* up to 4 in. long, spathulate, tip broadly rounded. *Heads* ¼ in. in diam., in spicate globose clusters, involucre-bracts linear, subacute, shining. *Achenes* minutely papillose. *Pappus-hairs* cohering at the base.

Upper Gangetic Plain (Falconer); Bijnor, Moradabad and Meerut (T. Thomson). DISTRIB. N. Bengal, Behar and Garo Hills. Indigenous in America and supposed to have been introduced with American cotton-seed. A much larger and shorter plant than *G. indicum*, and the heads are twice the size.

4. **G. pulvinatum,** *Delile Fl. Egypte 266, t. 44; F. B. I. iii, 289; Cooke Fl. Bomb. ii, 31.* G. depressum, *Roxb; Fl. Ind. iii, 425.*

A woolly annual. *Stems* 1-6 in. long, spreading from the root, prostrate. *Leaves* small, spathulate, narrowed into a short petiole. *Heads* minute, $\frac{1}{12}$ in., immersed in wool in the axils of the crowded terminal leaves. *Involucre-bracts* slender, linear, recurved, green, with acute hyaline tips. *Corolla* yellow. *Achenes* slender, minutely papillose.

Abundant within the area, especially in sandy ground. DISTRIB. Throughout the plains of India from the Punjab and Sind, extending to Burma and westwards to Egypt.

19. CÆSULIA, Roxb.; Fl. Brit. Ind. iii, 291.

A glabrous marsh herb. *Leaves* alternate, remotely serrulate. *Heads* axillary, sessile. *Flowers* all hermaphrodite, fertile, pale-blue or white, the outer sub-racemosely stipitate or sessile, the inner sessile. *Involucre* large, membranous; bracts 2, orbicular or ovate. *Receptacle* with a few paleæ to the outer flowers, naked in the centre, glabrous. *Corolla* tubular, the limb narrowly campanulate, deeply 5-fid. *Anther-bases* sagittate, tails consisting of a small bundle of fine hairs. *Style-arms* short, clavate. *Achenes* flat, obovoid, notched, winged on each side. *Pappus* of 2 ovate scales. A single species confined to India.

I am indebted to my friend Dr. T. Cooke for drawing my attention to the correct floral structure of this remarkable plant.

C. axillaris, *Roxb. Cor. Pl. i, 64, t. 93; Fl. Ind. iii, 447; Royle Ill. 246; F. B. I. iii, 291; Cooke Fl. Bomb. ii, 35.* Meyeria orientalis, *Don. Prod. 180.*

A glabrous semi-aquatic herb. *Stems* 6-12 in. long, stout, more or less branched, prostrate or suberect, striate. *Leaves* sessile, 2-6 in. long,

narrowly lanceolate, acuminate, tapering to the auricled base, remotely serrulate. *Involucral-bracts* crenulate or dentate, with a dorsal apiculus near the apex. *Achenes* $\frac{1}{16}$-$\frac{1}{8}$ in., usually with a prominent rib down the centre of each face, sparsely hairy. *Pappus-scales* apiculate.

Common within the area, especially in rice-fields and in marshy ground. Flowers during the autumn months. DISTRIB. Throughout the greater part of India, ascending to 3,000 ft. on the Himalaya. Not found in Ceylon nor in the Malay Peninsula.

20. INULA, Linn.; Fl. Brit. Ind. iii, 291.

Herbs, rarely shrubs. *Leaves* radical and alternate. *Heads* solitary, corymbose or panicled, heterogamous, radiate, rarely discoform. *Ray-flowers* female, 1- many- seriate, fertile; *ligule* long, short or minute, yellow or white, 2-3-toothed. *Disk-flowers* 2-sexual, fertile, tubular, yellow; limb elongate, 5-toothed. *Involucral-bracts* many-seriate, inner usually scarious; outer more or less herbaceous and sometimes foliaceous. *Receptacle* flat or tumid, pitted or areolate. *Anther-bases* sagittate; tails slender, simple or branched. *Style-arms* of 2-sexual flowers broader upwards, obtuse or truncate. *Achenes* subterete, usually ribbed. *Pappus-hairs* 1-2-seriate, few or many, smooth scabrid or bearded.—Species about 90, European, African, and Asiatic.

Shrubs.

Branches leaves beneath and corymbs densely silky or woolly; heads many, $\frac{1}{8}$ in. in diam. . 1. *I. Cappa.*

Branches and leaves glabrous; heads few, in short axillary racemes, $\frac{1}{2}$ in. in diam. . . . 2. *I. rubricaulis.*

Herbs.

Viscid or glabrate; involucral-bracts slender, scarcely recurved . . . . . 3. *I. indica.*

Villous; involucral-bracts squarrose, with filiform recurved tips . . . . . 4. *I. vestita.*

1. I. Cappa, *DC. Prod. v, 469; F. B. I. iii, 295; Gamble Man. 427; Collett Fl. Siml. 258.* Conyza Cappa, *Ham. in Don. Prod. 176.*

An aromatic shrub, 4-8 ft. high. Branches leaves beneath and corymbs densely villous or woolly. *Branches* very stout. *Leaves* sessile or shortly petioled, 3-6 in. long, oblong or oblong-lanceolate, acute or obtuse, glabrous or pubescent above, silky-tomentose beneath, base rounded or acute. *Heads* very many, $\frac{1}{8}$ in. in diam. corymbose. *Involucral-bracts* narrowly linear or subulate, rigid, pubescent;

the outer ones gradually shorter. *Ligules* few, short or obsolete. *Achenes* $\frac{1}{20}$ in., silky. *Pappus* $\frac{1}{8}$ in., grey, hairs thickened at the ends.

Dehra Dun and Siwalik range, in sal forests. Flowers in Sept. and Oct. DISTRIB. Temp. Himalaya from Simla to Bhutan, ascending to 10,000 ft. in Kumaon; also on the Khasia Hills, and in Upper Burma, China, and Malaya.

2. **I. rubricaulis**, *Clarke Comp. Ind. 126; F. B. I. iii, 296.*

A shrub up to 6 ft. high, with long flexuous glabrous reddish branches. *Leaves* sessile, 1-4 in. long, elliptic-lanceolate, acuminate, serrate, membranous, pilose when young, becoming quite glabrous; nerves almost parallel with the margins. *Corymbs* less than ½ the length of the leaves, sometimes racemed towards the ends of the branches. *Heads* ½ in. in diam., 3-5 together in very short axillary corymbs; the peduncles and pedicels slender, pilose. *Involucre-bracts* straight, subulate-lanceolate, acuminate or aristate, green or purplish, pilose or hispid outside. *Ray-florets* in one series, yellow, with long conspicuous ligules. *Achenes* ⅛ in., slender, clothed with appressed silky hairs. *Pappus* ½ in., white, the hairs not thickened at the tips.

Near the Robber's Cave, Dehra Dun (Gamble). DISTRIB. Himalaya from Kumaon to Sikkim, ascending to 6,000 ft.

3. **I. indica**, *Linn. Sp. Pl. ed. II, 1236.* Vicoa auriculata, *Cass.; F. B. I. iii, 297; Collett Fl. Siml. 260.* V. indica, *DC.; Royle Ill. 248.* Doronicum calcaratum, *Roxb. Fl. Ind. iii, 434.*

A slender rather rigid roughly pubescent often viscid herb. *Stem* 1-3 ft. high, the upper portion with many spreading branches. *Leaves* sessile, usually 1-2 in., long, but often much longer, lanceolate or oblong-lanceolate from a broad auricled base, acuminate, entire or serrulate, often scabrid on both surfaces; basal auricles rounded or hastate, sometimes laciniate. *Heads* ¼-¾ in. in diam, on long slender spreading peduncles. *Involucre-bracts* slender, scarcely recurved. *Flowers* orange-yellow; *ligules* revolute, as long as the involucre. *Achenes* $\frac{1}{30}$ in., pale, terete, sparsely hairy. *Pappus* of ray-flowers 0; of the disk few, slender, free at the base.

Common in most parts of the area. DISTRIB. Up to 4,000 ft. on the Western Himalaya and throughout the drier parts of India from the Punjab to S. India and Ceylon; found also in Burma but not in Malaya.

4. **I. vestita**, *Wall. Cat. 2962.* Vicoa vestita, *Benth; F. B. I. iii, 297; Collett Fl. Siml. 260.*

A softly hairy or woolly herb, 10-18 in. high. *Leaves* 1-2 in. long, oblong or linear-oblong from a broadly auricled base, obtuse or subacute, serrate, thin. *Involucre-bracts* squarrose; the tips filiform, recurved. *Heads* bright-yellow, ¾-1 in. across; *ligules* long, narrow, spreading. *Achenes* subsilky.

Dehra Dun, Siwalik range, and in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. DISTRIB. Drier parts of India from the Punjab eastwards to Bengal, and south to the Konkan; also Skardu in W. Tibet extending to Afghanistan. A shorter and stouter plant than the preceding and with more numerous and narrower ligules. The achenes and pappus are similar in both.

21. PULICARIA, Gærtn.; Fl. Brit. Ind. iii, 297.

Annual or perennial herbs, usually woolly or villous. *Leaves* alternate, sessile, often amplexicaul. *Heads* solitary, radiate and heterogamous or disciform and homogamous, yellow. *Ray-flowers* female, 1-2-seriate; *ligules* narrow, or minute or 0. *Disk-flowers* 2-sexual, fertile, slender; limb elongate, shortly 5-fid. *Involucre* hemispheric or obconic; *bracts* in few series, narrow, acuminate or awned. *Receptacle* flat or subconvex, pitted. *Anther-bases* sagittate; tails capillary, simple or branched. *Style-arms* of female flowers linear, obtuse. *Achenes* terete or ribbed. *Pappus* double; outer of short jagged teeth; inner of smooth scabrid or bearded filiform or flattened hairs.—Species about 24, in Europe, Asia, and Africa.

Ray-flowers tubular, achenes hairy . . 1. *P. foliolosa.*

Ray-flowers ligulate, achenes glabrate.

Leaves flat, entire or serrulate . . 2. *P. angustifolia.*

Leaves cottony beneath, margins recurved toothed and crisped . . . . 3. *P. crispa.*

1. **P. foliolosa,** *DC. Prod. v, 480; F. B. I. iii, 298; Watt E. D.; Cooke Fl. Bomb. ii, 34.* Blumea senecionidea, *Edgew. Fl. Banda 16.*

A copiously branched annual, 1-2 ft. high, subglabrous below, gland-pubescent or tomentose above. *Leaves* sessile, 1-6 in. long, linear oblong or oblanceolate from a broad or contracted ½-amplexicaul base, entire. *Heads* on slender peduncles, woolly and glandular. *Involucre-bracts* subsetaceous, woolly and glandular outside. *Ray-florets* filiform, tubular. *Achenes* very small, minutely hairy. Inner *pappus-hairs* few, white; outer a minute cup with serrate edges.

Beds and banks of rivers, and in open waste ground, but not common, Bundelkhand (Edgeworth). DISTRIB. Eastwards to Bengal and the Sikkim Terai, and south to the C. Prov. and Bombay; extending also through the Punjab to Afghanistan and Baluchistan, where it is sufficiently abundant to be used as fodder for camels.

2. **P. angustifolia,** *DC. Prod. v, 479; F. B. I. iii, 299; Cooke Fl. Bomb. ii, 34.* P. saxicola, *Edgew. in Journ. Linn. Soc. ix, 323.*

A very variable herb, glaucous and softly pubescent. *Stems* usually procumbent, 3-9 in. long, sometimes woody at the base. *Branches*

ascending. *Leaves* sessile, about 1 in. long, linear-oblong or obovate, narrowed towards the base, entire or serrulate, obtuse or apiculate and recurved at the tips. *Heads* about ½ in. in diam. Outer *involbracts* herbaceous, lanceolate, obtuse or subacute; inner scarious, acute. *Ray-fl.* ligulate, yellow, the ligules exceeding the bracts, early deciduous. Inner *pappus-hairs* twice as long as the minute glabrate achenes; outer pappus a laciniate cup.

Jumna ravines near Delhi and Agra (Royle, Jacquemont and Duthie), Bundelkhand (Edgeworth and Duthie). Flowers during the cold season. DISTRIB. Chota Nagpur, Mt. Abu, Sindh, Konkan; also in Baluchistan. Bengal specimens are much more robust than those of the north-west which, in Mr. Clarke's opinion, belong to Edgeworth's *P. saxicola*.

3. **P. crispa.** *Schultz-Bip. in Webb & Berth. Phyt. Canar. ii, 223; F. B. I. iii, 299.* Francœuria crispa, *Cass.; Royle Ill. 248.*

A stout shrubby perennial, 1-2 ft. high; branches with ascending very leafy branches. *Leaves* ½-amplexicaul, ½-1½ in. long, linear-oblong; margins recurved, dentate, undulate crispate, more or less clothed beneath with white wool. *Heads* ½-¾ in. in diam; *Invol-bracts* slender, setaceous, pubescent outside. *Ligules* shorter than the bracts. *Pappus-hairs* connate at the base in a ring, white, 3 times as long as the glabrate achenes.

Widely distributed throughout the area on river-banks and waste ground. Flowers in Feb. and March. DISTRIB. Bengal, Punjab Plain, Sindh, and westwards through Afghanistan and Persia to N. Africa. The dried plant is said to be used in the Punjab as an application to bruises.

22. XANTHIUM, Linn.; Fl. Brit. Ind. iii, 303.

Coarse rough annuals, unarmed or with 3-fid spines. *Leaves* alternate, toothed or lobed. *Heads* monœcious (female and 2-sexual), axillary; *Biserual heads* in the upper axils, globose, many-flowered; flowers sterile, tubular, 5-toothed. *Female heads* 2-flowered, fertile, apetalous. *Involucre* of 2-sexual heads short; *bracts* few, 1-2-seriate, narrow; *receptacle* cylindric, with hyaline pales inclosing the flowers. *Involucre* of female heads with the bracts united into an ovoid 2-beaked herbaceous 2-celled utricle with one flower in each cell, clothed with hooked bristles and with sometimes a few small free outer bracts. *Filaments* monadelphous; *anthers* free, bases obtuse; tips mucronate, inflexed. *Style* of 2-sexual flowers slender, undivided; arms of fem. flowers free, exserted from the involucre. *Achenes* inclosed in the hardened involucral cells, obovoid, thick. *Pappus* 0.—Species about 4, probably all American.

X. strumarium, *Linn. Sp. Pl. 987; F. B. I. iii, 303; Watt E. D.; Collett Fl. Simi. 261; Cooke Fl. Bomb. ii, 37. X. indicum, DC.; Roxb. Fl. Ind. iii, 601.*—Vern. *Chota datura.*

A coarse unarmed herb. *Stem* short, stout, slightly branched, spotted, harsh with bristly hairs. *Leaves* petioled, 2-3 in. long, triangular-cordate, cuneate at the base; lobes toothed, undulate, scabrous on both sides. *Heads* in terminal and axillary racemes; barren many, crowded at the top of the stem. Fruiting *involucres* ½ in. long, ovoid or oblong, covered with hooked prickles; beaks 2, erect.

Common within the area in waste places and near habitations. DISTRIB. Himalaya up to 6,000 ft. and throughout the hotter parts of India and in Ceylon; also found in China and in other warm parts of the world. It is probably indigenous in America. The leaves yield a yellow dye, and an oil is obtained from the seeds. The fruit is used medicinally.

23. SIEGESBECKIA, Linn., Fl. Brit. Ind. iii, 303.

Glandular-pubescent herbs. *Leaves* opposite, toothed. *Heads* in leafy panicles, heterogamous, subradiate, yellow or white. *Ray-flowers* female, 1-seriate, fertile, tube short, limb 2-3-fid. *Disk-flowers* 2-sexual, fertile, or the inner sterile, tubular, limb campanulate and 5-fid, or narrow and 3-4-toothed. *Involucre* campanulate or hemispheric; *bracts* few, herbaceous, glandular; outer spathulate, spreading, inner inclosing the ray-flowers. *Receptacle* small; pales membranous, concave, often inclosing the flowers. *Anther-bases* entire. *Style-arms* of 2-sexual flowers short, flattened, subacute. *Achenes* obovoid-oblong, not compressed, often incurved, obtuse. *Pappus* 0.—Species 2, one cosmopolitan, the other Peruvian.

S. orientalis, *Linn. Sp. Pl. 900; F. B. I. iii, 304; Collett Fl. Simi. 262; Cooke Fl. Bomb. ii, 38.* S. brachiata, *Roxb. Fl. Ind. iii, 439.*

A large erect, pubescent annual up to 4 ft. high; lower branches opposite, spreading; the upper 2-chotomous, often tinged with purple. *Leaves* opposite, petioled, 1-5 in. long and broad, triangular-ovate, acute or acuminate, deeply and irregularly toothed, both surfaces appressedly pubescent; the upper ones smaller and nearly entire; petioles winged. *Heads* ¼ in. in diam. pedunculed, arranged in leafy panicles. *Flowers* yellow, rarely white, those of ray often tinged with red beneath. *Involucre-bracts* in two series; the outer linear-spathulate or clavate, spreading, with viscous hairs on the upper surface; inner short, boat-shaped, glandular-hairy on the back, each enveloping a ray-floret. *Achenes* curved, black, each inclosed within a boat-shaped bract.

Very common on the edges of rice-fields and streams, DISTRIB. Abundant on the Himalaya up to 5,000 ft. and throughout India and Burma generally. Cosmopolitan in warm countries.

24. ECLIPTA, Linn.; Fl. Brit. Ind. iii, 304.

Strigose or hirsute annuals. *Leaves* opposite. *Heads* small, axillary or terminal, pedunculed, heterogamous, rayed. *Ray-flowers* female, sub-2-seriate, fertile or sterile; *ligules* small, entire or 2-toothed, white rarely yellow. *Disk-flowers* 2-sexual, fertile, tubular, limb 4-5-fid. *Involucre* broadly campanulate; *bracts* sub-2-seriate, herbaceous, outer large and broad. *Receptacle* flat, or nearly so, pales inclosing several flowers, inner narrow or 0. *Anther-bases* obtuse, subentire. *Style-arms* flattened, with short or triangular obtuse appendages. *Achenes* of ray narrow, triquetrous, often empty; of the disk stouter, laterally subcompressed, top entire toothed or 2-aristate.—Species 3 or 4, one cosmopolitan, another in S. America, and a third in Australia.

E. erecta, *Linn. Mantiss. ii, 286; Cooke Fl. Bomb. ii, 38.* E.-prostrata, *Linn.; Roxb. Fl. Ind. iii, 438.* E. alba, *Hassk.; F. B. I. iii, 304; Watt E. D.; Collett Fl. Siml. 262.*

A strigose slender weed. *Stems* erect or prostrate and often rooting at the nodes. *Leaves* sessile, 1-4 in. long, but very variable, linear or oblong-lanceolate, narrowed at both ends, entire or serrate, strigose on both sides. *Heads* ¼-½ in. in diam., solitary or 2 together on stiff unequal peduncles. *Invol-bracts* obtuse or acute, strigose outside *Ligules* white, spreading, linear, not toothed. *Achenes* with 2 of the angles winged, the sides covered with warty excrescences. *Pappus* 0, or of a few minute teeth.

Abundant within the area. Flowers during the greater portion of the year. DISTRIB. Throughout India and in Ceylon, extending up to 6,000 ft. on the Himalaya; cosmopolitan in all warm countries. The plant is used medicinally in many parts of India; and in Bengal the fresh leaves are employed in tatooing the skin.

25. SCLEROCARPUS Jacq.; Fl. Brit. Ind. iii, 305.

Strigose or villous herbs. *Leaves* alternate or opposite. *Heads* terminal or in the forks, or leaf-opposed; heterogamous, rayed, yellow. *Ray-flowers* neuter, 1-seriate, *ligules* spreading. *Disk-flowers* 2-sexual, fertile, tubular, limb 3-5-fid. *Involucre* campanulate; *bracts* few, 2-seriate, all or the tips herbaceous, outer spreading. *Receptacle* convex or conic; pales enfolding the base of the 2-sexual flowers and finally hardening round the achenes. *Anther-bases* subentire. *Style-arms* of 2-sexual flowers elongate, acute obtuse or subclavate. *Achenes* obovoid, subcompressed, glabrous, narrowed below, inclosed in the rugose often beaked pales.

Pappus 0 or a ring.—Species about 11, in Asia, Africa, and Trop. America.

S. africanus, *Jacq. Ic. Pl. Rar. i, 17, t. 176; F. B. I. iii, 305; Collett Fl. Siml. 262; Cooke Fl. Bomb. ii, 39.*

An erect annual, 1-2 ft. high. *Branches* terete, striate, hispidly hairy. *Leaves* petioled 1½-3 in. long, ovate, acute, narrowed into the petiole, remotely serrate, both surfaces appressedly hairy, 3-5-nerved. *Heads* pedunculed or sessile, ¼-½ in. in diam. *Involucre-bracts* foliaceous, linear-oblong, obtuse, hairy. *Achenes* curved, ribbed, glabrous, inclosed by the boat-shaped paleæ of the receptacle.

Dehra Dun and Sub-Himalayan tracts of Rohilkhand and N. Oudh, Merwara (Duthie), Bundelkhand (Edgeworth), DISTRIB. W. Himalaya from Simla to Kumaon up to 5,000 ft., Punjab, Konkan, and Deccan; also in Trop. E. and W. Africa.

26. BLAINVILLEA, Cass.; Fl. Brit. Ind. iii, 305.

Scabrid or villous herbs. *Leaves* opposite, or the upper alternate, petioled, toothed. *Heads* small, subsessile or pedunculed, terminal or axillary, heterogamous, radiate or subdisciform, yellow. *Ray-flowers* female, 1-2-seriate, fertile; *ligules* small, 2-3-toothed, or 0. *Disk-flowers* 2-sexual, fertile, tubular; limb dilated, 5-fid. *Involucre* broadly ovoid or subglobose; *bracts* few, outer herbaceous, inner passing into the rigidly membranous concave or folded scales of the small convex receptacle. *Anther-bases* obtuse, entire. *Style-arms* of 2-sexual flowers narrow, flattened, with acute or subobtuse appendages. *Achenes* truncate, of ray 3-quetrous or dorsally compressed, of the disk 3-4-angled or laterally compressed. *Pappus* of 2-5 pale-like scales or of unequal bristles, connate at the base. Species about 10, all tropical.

B. rhomboidea, *Cass. in Dict. Sc. Nat. xxix, 493; Cooke Fl. Bomb, ii, 40.* B. latifolia, *DC.; F. B. I. iii, 305; Collett Fl. Siml. 263.* B. alba and hispida, *Edgew. in Trans. Linn. xx, 70.* Verbesina Lavenia *Roxb. Fl. Ind. iii, 442.*

A rigid much-branched hispidly hairy annual, 1-3 ft. high. *Branches* subterete, striate, scabrous. *Leaves* petioled, 2-4 in. long, ovate or ovate-lanceolate, acute or acuminate, shallowly crenate, 3-nerved at the cuneate or cordate base, hispid on both surfaces. *Heads* shortly pedunculed, ½-¾ in. in diam., arranged in dichotomous terminal cymes. Outer *involucre-bracts* ovate-lanceolate, acute, hispid outside with white hairs; inner membranous, rigid, with a truncate pectinate hispid apex. *Ligules* of ray-flowers yellow or whitish, very short, bifid.

Achenes of ray cuneiform, triquetrous, curved, hispid those of the disk shorter and nearly straight.

Chilkana in the Saharanpur district (T. Thomson), Bundelkhand (Edgeworth). Flowers during the cold season. DISTRIB. In Kumaon up to 5,000 ft., from the Punjab Plain and Bengal to S. India, Ceylon and Upper Burma; also in Java, Trop. Africa, America, and Australia. The plant has a faint pleasant aromatic smell (Roxb).

27. WEDELIA, Jacq.; Fl. Brit. Ind. iii, 306.

Scabrid pubescent or hirsute herbs or undershrubs. *Leaves* opposite. *Heads* axillary or terminal, heterogamous, radiate, yellow. *Ray-flowers* female, fertile; *ligule* spreading, entire or 2-toothed. *Disk-flowers* female, fertile or the central sterile, tubular; limb elongate, 5-toothed. *Involucre-bracts* sub-2-seriate; outer 3-5, usually herbaceous or foliaceous, inner dry. *Receptacle* flat or convex, pales inclosing the flowers. *Anther-bases* entire or subsagittate. *Style-arms* of 2-sexual flowers with acute hairy tips. *Achenes* cuneate-oblong or obovoid, thick, smooth or tubercled, laterally compressed or the outer triquetrous, tip rounded, margins obtuse or thickened. *Pappus* 0, or a toothed cup or ring, or of short scales, with sometimes a few bristles.—Species about 45, tropical and subtropical.

W. Wallichii, *Less. in Linnæa vi, (1831), 162; F. B. I. iii, 307.*

A suberect hispid or scabrid herb. *Leaves* petioled, 2-4½ in. long, ovate acuminate, serrate, 3-nerved, usually hispid on both surfaces, and with appressed bulbous-based hairs. Outer *involucre-bracts* oblong, obtuse or acute, equalling or exceeding the disk-flowers, hispid outside; inner scarious and with toothed edges. *Achenes* obovoid, compressed or obscurely 3- or 4-angled; tip contracted, laxly hispid. *Pappus* a toothed cup often bearing a few bristles.

Dehra Dun (Duthie). DISTRIB. Trop. Himalaya up to 5,000 ft. in Kumaon and eastwards to Bhutan and the Khasia Hills; also in Burma, and Java.

28. SPILANTHES, Linn.; Fl. Brit. Ind. iii, 307.

Annual herbs. *Leaves* opposite. *Heads* usually long-peduncled, axillary or apparently terminal, heterogamous and radiate, or homogamous and disciform. *Ray-flowers* female, 1-seriate fertile, *ligule* white or yellow. *Disk-flowers* 2-sexual, fertile, tubular, limb 4-5-fid. *Involucre* ovoid or campanulate, *bracts* sub-2-seriate.

Receptacle convex, elongate, pales inclosing the flowers, often connate with the ovary into a stalk. *Anther-bases* truncate, entire or 2-toothed. *Style-arms* of the 2-sexual flowers truncate. *Achenes* of ray triquetrous or dorsally compressed, margins and angles usually ciliate. *Pappus* 0, or of 2-3 bristles.—Species 20, chiefly in Trop. America.

S. **Acmella,** *Murr. Syst. Ed. xiii, 610; Roxb. Fl. Ind. iii, 410; F. B. I. iii, 307; Wall. E. D.; Collett Fl. Siml. 263; Cooke Fl. Bomb. ii, 42.*

An erect or ascending more or less hairy annual. *Leaves* petioled, ½-1½ in. long, ovate-lanceolate, acute or sub-obtuse, usually cuneate at the base, irregularly crenate-serrate or sometimes entire, glabrous. *Heads* usually long-peduncled, ¼-¾ in. long, solitary or panicled. *Involucre-bracts* oblong-lanceolate, subacute, ciliate. *Ligules* (when present) minute, white or yellow. *Achenes* glabrous or scabrid.

Abundant within the area. DISTRIB. Throughout India and in Ceylon, ascending to 5,000 ft. on the Himalaya and in all warm countries. The heads, especially those of the cultivated variety (S. oleracea) have a hot pungent taste and are used medicinally and the leaves as a pot-herb.

29. GLOSSOCARDIA, Cass.; Fl. Brit. Ind. iii, 308.

A branched glabrous annual. *Leaves* alternate, slender, 1-2-pinnatisect. *Heads* small, terminal and axillary, heterogamous, rayed, yellow. *Ray-flowers* female, usually solitary, fertile; *ligule* 2-fid. *Disk-flowers* 2-sexual, few, fertile, tubular, limb 4-fid. *Involucre* oblong; *bracts* few; inner oblong, with broad membranous margins; outer 1-3, slender. *Receptacle* small, flat; pales few, flat. *Anther-bases* obtuse, entire. *Style-arms* of 2-sexual flowers with linear acute hispid tips. *Achenes* narrowly oblong, dorsally much compressed, faces bearded. *Pappus* of 2 smooth stiff awns. —A single species.

G. linearifolia, *Cass. in Dict. Sc. Nat. xix, 62; F. B. I. iii, 308; Cooke Fl. Bomb. ii, 43.* Vorbesina Boswellia, *Roxb. Fl. Ind. iii, 443.*

A small usually prostrate glabrous annual, diffusely branched from the base; branches 3-10 in. long, grooved. *Leaves* on slender petioles, ½-2 in. long, 2-pinnatisect; segments narrowly linear, apiculate. *Heads* ¼ in long. Outer *involucre-bracts* small, usually 3, with a greenish midrib and membranous ciliate margins; inner much larger, oblong, obtuse, striate, glabrous, and with pale membranous margins. *Achenes* ¼ in. long, densely bearded especially on the edges with stiff hairs. *Pappus-awns* spreading.

On sandy ground, especially in the districts of Delhi, Agra, Merwara and Bundelkhand. In flower during the early part of the cold season. DISTRIB. Chota Nagpur and in C. and W. and S. India. The plant which has a scent like that of fennel is eaten as a vegetable, especially in years of scarcity. It is also used medicinally in the Bombay Pres.

30. BIDENS, Linn.; Fl. Brit. Ind. iii, 309.

Annual or perennial sometimes climbing herbs. *Leaves* opposite, entire toothed gashed or 1-2-pinnate. *Heads* corymbosely panicled or subsolitary, heterogamous and rayed, or homogamous and disciform. *Ray-flowers*, if present, female or neuter, 1-seriate; *ligule* spreading, yellow or white. *Disk-flowers* 2-sexual, fertile, tubular; limb cylindric, 5-fid. *Involucre* campanulate or hemispheric; *bracts* sub-2-seriate, bases connate; outer herbaceous, short or leafy, inner membranous. *Receptacle* flat or convex; pales narrow, nearly flat. *Anther-cells* entire or subsagittate. *Style-arms* of 2-sexual flowers hairy above; tips short, acute, or long and subulate. *Achenes* 4-gonous or dorsally compressed, linear or cuneiform, often narrowed but not beaked above. *Pappus* of 2-4 rigid retrosely hispid bristles or 0.—Species about 50, chiefly American.

B. pilosa, *Linn. Sp. Pl. 832; F. B. I. iii, 309; Collett Fl. Siml. 264; Cooke Fl. Bomb. ii, 44.* B. bipinnata, Linn.; Roxb. Fl. Ind. iii, 411.

An erect glabrous or pubescent annual, 1-3 ft. high. *Stems* 4-angular, grooved, thickened at the nodes. *Leaves* very variable, 3-fid, 3-foliolate or 1-2-pinnatifid; the terminal segments ovate, acute, serrate; petioles dilated and sheathing at the base. *Heads* (in flower) about ½ in. in diam., elongating in fruit. Outer *involucre-bracts* linear, obtuse, ciliate, shorter than the acute broadly margined inner ones. *Ray-flowers* ligulate, white or yellow. Ripe *achenes* ½-¾ in. long, slender, 4-angular, glabrous, black, exceeding the involucre. *Pappus-awns* spreading, yellow.

Common within the area. DISTRIB. Throughout India, ascending to 6,000 ft. on the Himalaya; also in Afghanistan and in all warm countries. Probably of American origin.

31. GLOSSOGYNE, Fl. Brit. Ind. iii, 310.

Perennial glabrous herbs, with almost naked stems and branches. *Leaves* radical, crowded, pinnatifid, or cuneate and 3-toothed; cauline alternate, or the lower opposite, or 0. *Heads* small, few,

corymbose, heterogamous and rayed, or homogamous and discoiform. *Ray-flowers* female, fertile; *ligules* spreading, yellow (or white?). *Disk-flowers* 2-sexual, fertile, tubular, limb 5-fid. *Involucre* small; *bracts* 2-3-seriate, narrow, bases connate. *Receptacle* flat; pales scarious, flat or concave. *Anther-bases* obtuse. *Style-arms* of 2-sexual flowers with long hairy tips. *Achenes* dorsally compressed, linear, ovoid or almost winged, glabrous, truncate. *Pappus* of retrosely scabrid bristles. Species 5, in Asia and Australia.

C. pinnatifida, *DC. in Wight Contrib. 19; F. B. I. iii, 310; Watt. E. D.; Cooke Fl. Bomb. ii, 45.* Zinnia bidens, *Retz.; Roxb. Fl. Ind. iii, 435.*

Root fusiform, woody. *Stems* usually many from the root, erect or ascending, 6-18 in. high; branches slender, forked. *Leaves* mostly radical, 1-2 in. (with petiole), pinnatifid, triangular; segments few, rigid, linear, acute, glabrous; veins prominent beneath. Flowering branches 6-12 in. long, with a small pinnatisect leaf at each fork, stiff, grooved. *Heads* few, long-pedunculed, ½ in. in diam. *Involucre-bracts* ¼ in in diam., linear, obtuse, glabrous. *Achenes* ¼-⅓ in., deeply grooved, black.

Fairly common in sandy ground, especially along the base of the Himalaya from Dehra Dun to N. Oudh, also in Bundelkhand. Flower Sept. and Oct. DISTRIB. Punjab Plain, W. Beng. and south to Madras. A preparation from the root is said to be employed by the Santals as a remedy for snake bite and scorpion stings.

32. CHRYSANTHELLUM, Rich.; Fl. Brit. Ind. iii, 310.

Annual glabrous herbs. *Leaves* alternate, pinnatifid, or radical toothed. *Heads* small, pedunculed, terminal and axillary, heterogamous, rayed. *Ray-flowers* female, 1-seriate, fertile; *ligule* spreading, entire or 2-toothed, yellow. *Disk-flowers* 2-sexual, fertile, tube short; limb campanulate, 5-fid. *Involucre* hemispheric; *bracts* 1-2-seriate. *Receptacle* flat; pales narrow, flat, scarious. *Anther-bases* obtuse, entire. *Style-arms* of 2-sexual flowers slender; tips long, subulate. *Achenes* linear-oblong, dorsally compressed, smooth; outer thick, with obtuse margins, often tuberc'led externally; inner flat, 2-winged. *Pappus* a minute corona.—Species 2 or 5, in Asia, Africa, and America.

C. indicum, *DC. Prod. v, 631; F. B. I. iii, 310.*

A procumbent diffuse annual. *Stems* rigid, 4-angular, grooved, glabrous or scabrid. *Leaves* long petioled, 1-3 in. long, deltoid in outline; segments oblong or cuneiform, obtusely lobed or cut, with a mucro at the apex of each ultimate division, translucent, succulent; petioles

dilated towards their sheathing bases, the margins membranous. *Heads* ¼ in. in diam., enlarging in fruit. *Involucre-bracts* equalling the achenes, oblong or elliptic, obtuse, strongly nerved and with rather broad membranous margins. *Achenes* $\frac{1}{10}$ in. long, cuneate-oblong, obcompressed, grooved, smooth, the margins very thick.

Abundant, especially in wet sandy ground. Flowers during Sept. and Oct. DISTRIB. Garhwal and Kumaon up to 4,000 ft., Punjab Plain, Chota Nagpur, Chanda district in C. Prov., also in Madagascar and Trop. Africa.

33. GALINSOGA, Ruiz. & Pav.; Fl. Brit. Ind. iii, 311.

Annual herbs. *Leaves* opposite, entire or toothed. *Heads* small, peduncled, subterminal and axillary, heterogamous, rayed. *Ray-flowers* few, female, 1-seriate, fertile; ligules spreading, white. *Disk-flowers* 2-sexual, fertile, tubular, yellow, limb 5-fid. *Involucre* hemispheric; *bracts* few, 1-2-seriate, ovate, obtuse, striate. *Receptacle* conic or elongate; pales slender, serrate. *Anther-bases* subentire. *Style-arms* of 2-sexual flowers acute or with an acute short tip. *Achenes* angled or the outer dorsally compressed. *Pappus* of a few scarious, entire awned or fimbriate scales, of the ray often 0.—Species 5, natives of Trop. America.

G. parviflora, *Cav. Ic. iii, 41, t. 281; F. B. I. iii, 311; Collett Fl. Siml. 264.*

A weak rather flaccid annual, 6-12 in. high. *Stems* erect, glabrous below, hispid above. *Leaves* petioled, 1-2 in. long, ovate or ovate-lanceolate, obtusely acuminate, 3-nerved, subserrate, membranous. *Heads* ¼ in. in diam., on very slender peduncles. *Involucre-bracts* broad, green. *Receptacle* elongating in fruit. *Pappus-scales* narrowly oblong, edges fimbriate.

Dehra Dun. Flowers Aug. to Oct. DISTRIB. Very common on the W. Himalaya up to 8,000 ft. near villages and in cultivated ground where it has become quite an established weed. Indigenous in S. America.

34. TRIDAX, Linn.; Fl. Brit. Ind. iii, 311.

Perennial herbs. *Leaves* opposite, pinnatisect; segments few, narrow. *Heads* very long-peduncled, heterogamous, rayed. *Ray-flowers* female, fertile, ligulate or 2-lipped, with the outer lip large, 3-fid or 3-partite, the inner small 2-lobed or parted or 0. *Disk-flowers* 2-sexual, fertile, tubular; limb elongate, 5-fid. *Involucre-bracts* few-seriate; outer short, broad, herbaceous. *Receptacle* flat or convex; pales membranous. *Anther-bases* with short acute auricles. *Style-arms* of 2-sexual flowers hairy above, tips subulate.

Achenes turbinate or oblong, silky. *Pappus* of short or long aristate feathery bristles.—Species 7, natives of S. America, one of which has become naturalized in India.

T. procumbens, *Linn. Sp. Pl. 900; F. B. I. iii, 311; Cooke Fl. Bomb. ii, 45.*

A weak straggling pubescent or hispid herb, 1-2 ft. high. *Leaves* few, petioled, 1-2 in. long, ovate or lanceolate, coarsely dentate or pinnatisect, clothed on both sides with bulbous-based hairs, base acute. *Peduncles* often more than one foot long, solitary, slender, sparsely pilose. *Heads* ½ in. in diam. Outer *involucre-bracts* densely hairy, ovate, acuminate; inner longer, membranous, slightly pubescent on the back. *Ligules* of ray-flowers yellow, 3-partite. *Achenes* ⅛ in. long, brown. *Pappus* of many shining feathery bristles.

Abundant within the area by roadsides, in grassy places, and on old walls. Flowers during the greater part of the year. DISTRIB. A common plant throughout India. Indigenous in C. America.

35. MATRICARIA, Linn.; Fl. Brit. Ind. iii. 315.

Annual or perennial herbs. *Leaves* alternate, 1-2-pinnatisect. *Heads* terminal, peduncled, solitary or corymbose, heterogamous, rayed (rarely disciform). *Ray-flowers* female, fertile or sterile; ligule white, elongate or rarely short. *Disk-flowers* 2-sexual, fertile, tube terete or 2-edged, limb 4-5-fid. *Involucre* hemispheric; *bracts* in few series, appressed, margins usually scarious and brown, outer shorter. *Receptacle* naked. *Anther-bases* obtuse, entire. *Style-arms* of 2-sexual flowers with truncate and penicillate tips. *Achenes* oblong, often incurved; faces glandular or rugulose, truncate, dorsally convex, ribbed or not, ventrally 3-5-ribbed. *Pappus* very short, coroniform dimidiate or 0.—Species about 20; in Europe, North and S. Africa, Asia and America.

M. Chamomilla, *Linn. Sp. Pl. 891; F. B. I. iii, 315; Watt. E. D.* M. suaveolens, *Linn; Roxb. Fl. Ind. iii, 437.* (Persian Chamomile.)

A glabrous much-branched aromatic herb about 1 ft. high. *Leaves* 2-3-pinnatisect; segments almost filiform. *Heads* solitary, long-peduncled, ½-¾ in. in diam. *Involucre-bracts* oblong, margins white. Receptacle conic, elongating during fruiting. *Ligules* white, much longer than the bracts, deflexed after flowering or 0. *Achenes* with slender white ribs on the ventral face only. *Pappus* 0.

Moradabad and Meerut districts (T. Thomson), Upper Gangetic Plain (Royle). DISTRIB. Punjab Plain and westward to the Atlantic; also in N. Asia, and Japan. The flower-heads and the oil obtained by distillation from this plant are used in India as a substitute for the true Chamomile (*Anthemis nobilis*).

36. COTULA, Linn.; Fl. Brit. Ind. iii, 316.

Small often creeping annual or perennial herbs. *Leaves* alternate pinnatifid or pinnatisect, rarely entire or toothed. *Heads* small, pedunculed, heterogamous (rarely homogamous), disciform, yellow. Outer flowers female, 1-2-seriate, fertile; corolla conic or 0. *Disk-flowers* 2-sexual, fertile, tube slender or stout and 2-winged, limb 4-fid. *Involucre* hemispheric or campanulate; *bracts* sub-2-seriate, herbaceous or membranous, margins often scarious. *Receptacle* naked. *Anther-bases* obtuse, entire. *Style-arms* of 2-sexual flower, truncate or obtuse, styles of sterile flowers sometimes entire. *Achenes* of the ray or all stipitate, compressed, nerveless or 2-4-nerved, sometimes sheathed at the top by the base of the corolla, at other times with a short ear-shaped pappus.—Species about 40, in tropical and temperate regions.

Leaf-segments not aristate, achenes of disk-flowers winged . . .	1. *C. anthemoides.*
Leaf-segments aristate, achenes of disk-flowers not winged	2. *C. hemisphærica.*

1. C. anthemoides, *Linn. Sp. Pl. 891; Royle Ill. 248; F. B. I. iii, 316; Watt E. D.* Pleiogyne cardiosperma, *Edgew. in. Trans Linn. Soc. xx, 71.*

A weak diffuse much-branched usually glabrous annual. *Leaves* ½-2 in. long, 1-2-pinnatisect, ½-amplexicaul at the base; ultimate segments obtuse or shortly mucronate. *Heads* ⅛-⅜ in. in diam., solitary on the naked filiform pedunoles. *Achenes* of disk-flowers with thick narrow wings.

Upper Gang. Pl. (Royle), Moradabad (T. Thomson), Banda (Edgeworth). Flowers Jan. to March. DISTRIB. Punjab Plain, Behar, extending to China and N. and S. Africa. The flowers heated with oil are used as an external remedy for rheumatism.

2. C. hemisphærica, *Wall. Cat. 3236; F. B. I. iii, 316.* Artemisia hemisphærica, *Roxb. Fl. Ind. iii, 422.*

An erect annual, glabrous or villous above. *Stems* 6-8 in. long, branched above. *Leaves* pinnatisect or the uppermost simple; segments many, linear, aristate. *Heads* ¼ in. in diam., solitary, pedunoled, hemispheric, erect in flower, inclined or drooping in fruit. *Corolla* of the minute fem. flowers 2-toothed or 0. *Achenes* angled, not winged.

Common within the area, especially in the Sub-Himalayan tracts of Rohilkhand and N. Oudh. Flowers Jan.-March. DISTRIB. Plains of Punjab and Bengal and up to 2,500 ft. in Garhwal; also in Assam Chittagong and China.

37. **ARTEMISIA**, Linn. ; Fl. Brit. Ind. iii, 321.

Herbs or shrubs, usually strong-scented. *Leaves* alternate, entire serrate or 1-3-pinnatisect. *Heads* small, solitary or fascicled, racemose or panicled, never corymbose, heterogamous or homogamous, disciform. *Outer flowers* female, 1-seriate, fertile ; bowlla very slender, 2-3-toothed. *Disk flowers* 2-sexual, fertile or sterile, limb 5-fid. *Involucre* ovoid subglobose or hemispheric ; *bracts* few-seriate, outer shorter, margins scarious. *Receptacle* flat or raised, naked or hirsute. *Anther-bases* obtuse, entire. *Style-arms* of 2-sexual flowers with truncate usually penicillate tips, often connate in the sterile flowers. *Achenes* very minute, ellipsoid oblong or subobovoid, faintly striate. *Pappus* 0.—Species about 150 ; in north temperate regions, a few also in S. America.

Segments of cauline leaves filiform or setaceous ; disk-flowers sterile . .	1. *A. scoparia*.
Leaf-segments never filiform or setaceous : disk-flowers fertile . .	2. *A. vulgaris*.

1. **A. scoparia**, *Waldst & Kit. Pl. Rar. Hung i, 66 t. 65. F. B. I. iii, 323 ; Watt E. D. ; Collett Fl. Siml. 266 ; Cooke Fl. Bomb. ii, 47.* A. elegans, *Roxb. Fl. Ind. iii, 421.*

A glabrous or more or less pubescent annual or perennial herb, 3-6 ft. high. *Stems* slender, grooved, usually tinged with purple. Radical *leaves* long-petioled, 1-3 in. long, 1-3-pinnatisect, the segments linear ; cauline filiform or setaceous. *Heads* minute, sessile or on short capillary pedicels, arranged in second panicled racemes, yellow. Outer fem. *flowers* fertile, inner hermaphrodite flowers sterile and with larger corollas. *Involucre-bracts* glistening, oblong, obtuse, the margins scarious. *Achenes* very minute.

Dehra Dun, Saharanpur and in Sub-Himalayan tracts of Rohilkhand, also in Bundelkhand (Edgeworth). Flower during Sept. and Oct. DISTRIB. Punjab Plains and Sindh, and westward to Afghanistan and Cent. Eur. It extends up to 12,000 ft. in W. Tibet, and is found also in China and Japan. In the plains it occurs usually only as an annual, but at high elevations the rootstock becomes woody and perennial. The plant is used medicinally in the Punjab ; it is also eaten by cattle and sheep.

2. **A. vulgaris**, *Linn. Sp. Pl. 848 ; Roxb. Fl. Ind. iii, 420 ; F. B. I. iii, 325 ; Kanjilal For. Fl. Sch. Circ. 210 ; Gamble Man. 427 ; Collett Fl. Siml. 266 ; Cooke Fl. Bomb ii, 147.* A. indica *Willd. Roxb. Fl. Ind. iii, 419.* A. paniculata, *Roxb. l. c. 418.*—Vern. *Sarmi, samri* (Dehra Dun). (Indian Wormwood.)

A tall aromatic shrub-like herb, 2-8 ft., high, hoary pubescent or tomentose. *Stems* leafy paniculately branched. Lower *leaves* petioled,

2-4 in. long, ovate in outline, 1-2-pinnatisect, with stipule-like lobes at the base, more or less pubescent above, ashy-grey or white-tomentose beneath; upper leaves often sessile, linear-lanceolate, entire or 3-fid. *Heads* sessile or shortly pedicelled, ovoid or subglobose, arranged in subsecund spike-like suberect or horizontal panicled racemes, brownish-yellow. *Involucre-bracts* woolly or glabrate; outer small, herbaceous, inner mostly scarious. Outer fem. flowers very slender; inner hermaphrodite flowers fertile. *Achenes* minute.

Common in Dehra Dun as a garden weed, and in the vicinity of camping grounds. DISTRIB. Western Himalaya up to 12,000 ft., and eastwards to Sikkim, Assam and Burma; Mt. Abu in Rajputana, and on the hills W. and S. India to Ceylon; also in Europe, N. Asia, Malay Islands, Siam, China and Japan. The Dehra Dun plant belongs to the form known as *A. indica*, which has the lower surface of the leaves of an ashy-grey colour. An infusion of this plant is used medicinally; the plant is also employed to keep away fleas and other insects.

38. EMILIA. Cass.; Fl. Brit. Ind. iii, 335.

Annual or perennial herbs, often glaucous, glabrous or hairy. *Radical leaves* crowded, petioled, entire toothed or lyrate-pinnatifid; cauline few, stem-clasping. *Heads* long-peduncled, solitary or loosely corymbose, without bracteoles at the base, homogamous, discoid, yellow or red. *Flowers* all 2-sexual, fertile, tubular; limb elongate, 5-toothed. *Involucre* cylindric; *bracts* 1-seriate, equal, free or cohering, striate. *Receptacle* flat, naked. *Style-arms* subterete; tip short and obtuse, or long and acute. *Achenes* subterete or angled and 5-ribbed. *Pappus*-hairs copious, white, soft, slender.—Species 4 or 5; E. Indian and Trop. African.

E. sonchifolia. *DC. Prod. vi, 302; Royle Ill. 248; F. B. I. iii, 336; Collett Fl. Siml. 268; Cooke Fl. Bomb. ii, 49.* Cacalia sonchifolia, *Linn.; Don Prod. 160; Roxb. Fl. Ind. iii, 413.*

A slender somewhat glaucous herb, 10-18 in. high, glabrous puberulous or scabrid. *Stems* erect, or diffuse and often rooting at the nodes, more or less branched. *Leaves* 1½-4 in. long; lower petioled, lyrate-pinnatifid or obovate, entire or sinuate; upper smaller, amplexicaul, with acute or obtuse auricles. *Heads* ¼ in. long, solitary or laxly corymbose; peduncles very slender, nodding when young. *Involucre-bracts* nearly equalling the flowers, linear-oblong, acute, narrowly margined. *Corollas* pinkish-violet or white. *Style-arms* ½-cylindric, the tip conic. *Achenes* ⅛ in. long, with 5 scabrid ribs.

Common within the area. Flowers during the greater part of the year. DISTRIB. Throughout India, ascending to 5,000 ft. on the Himalaya, and in Ceylon; also in China and in tropical and subtropical Africa and in America (introduced).

39. SENECIO, Linn.; Fl. Brit. Ind. iii, 338.

Herbs undershrubs or shrubs. *Leaves* radical or alternate, entire or variously divided. *Heads* solitary corymbose or racemose, heterogamous (rarely homogamous), usually yellow. *Ray-flowers* female, fertile, ligulate (or 0). *Disk-flowers* 2-sexual, fertile, tubular, 5-fid. *Involucre* various; *bracts* 1- or sub-2-seriate, equal, erect, free or connate at the base, with few or many very short outer ones (heads bracteolate). *Receptacle* flat or convex, naked, pitted or fimbrillate. *Anther-bases* obtuse, or auricled, or minutely tailed. *Style-arms* of the 2-sexual flowers recurved, tips truncate and penicillate, rarely rounded or with a short narrow point. *Achenes* subterete; outer dorsally compressed, 5-10-ribbed. *Pappus-hairs* copious or sparse, soft, white, smooth, scabrid or barbellate.—Species about 900; chiefly in temperate regions and on mountains in the tropics.

S. nudicaulis, *Ham. ex Don Prod. 179; F. B. I. iii, 340; Collett Fl. Siml. 269.* S. denudatus, *Don Prod. 179.*

A glabrous or sparsely pubescent herb, 6 in. to 3 ft. high, usually scapigerous. Roots very fleshy. *Leaves* lobulate pinnatifid coarsely crenate toothed or nearly entire, usually smooth on the upper surface and tinged with purple beneath; radical leaves usually forming a rosette, sessile or narrowed into a winged petiole; cauline few, sessile, up to 7 in. long, linear-oblong or obovate, obtuse, irregularly crenate lobulate or toothed, the base contracted or dilated and auricled. *Heads* many, arranged in terminal corymbose panicles, ½ in. in diam., many-flowered, broadly campanulate; bracteoles minute and subulate or sometimes foliaceous. *Involucre-bracts* oblong, acute, or lanceolate and acuminate, 3-nerved, margins broadly scarious. Flowers yellow. *Ligules* long, narrow, 3-toothed. *Anther-bases* not tailed. *Achenes* puberulous, all with whitish pappus

Dehra Dun and Siwalik range (Edgeworth, Gamble, Duthie). Flowers during May and June. DISTRIB. Parasnath in Chota Nagpur, common on the W. Himalaya up to 10,000 ft. and eastwards to Bhutan; N. W. Frontier in the Kurram Valley, in Waziristan and in the Gilgit District. This plant is much used by the village people in Jaunsar and Garhwal for its medicinal properties.

40. ECHINOPS, Linn.; Fl. Brit. Ind. iii, 358.

Thistle-like herbs, with white tomentum. *Leaves* alternate, pinnatifid, spinous. *Heads* in globose involucrate balls, blue or white, sessile or shortly stipitate on a common receptacle, 1-flowered. *Flowers* 2-sexual, all fertile, tube slender, limb with 5 slender seg-

ments. *Involucre* oblong; *bracts* many-seriate, rigid, pungent or spinescent, outer shorter, inner spathulate, innermost linear or lanceolate, sometimes all connate into a tube with one long rigid spine on the outer side. *Receptacle* minute. *Filaments* glabrous; *anther-bases* sagittate, auricles connate; tails short, entire or fimbriate. *Style-arms* thick, and with a thick basal ring, at length spreading. *Achenes* elongate, usually villous. Pappus-crown of many short free or connate bristles.—Species about 70, in S. Europe, N. Africa, and Asia to Japan.

E. echinatus. *Roxb. Hort. Beng. 62; Fl. Ind. iii, 447; Royle Ill. 246; F. B. I iii, 358; Kanjilal For. Fl. Sch. Circ. 210; Collett Fl. Siml 270; Cooke Fl. Bomb. ii, 54.*—Vern. *Gokru.* (Globe Thistle).

A much-branched spreading rigid annual, 1-3 ft. high. *Stem* branched from the base, clothed with white cottony pubescence. *Leaves* sessile, 3-5 in. long, oblong, pinnatifid (the lobes ending in long rigid spines), glabrous or scaberulous above, white beneath with cottony wool. *Heads* 1-flowered, arranged in a compact globose inflorescence 1-1½ in. in diam. (excluding the stout spines). *Involucre* of each head surrounded by strong white pappus-like bristles; outer invol-bracts 6-8, oblanceolate, glabrous, pungent, one or two often produced into long sharp spines 1 in. or more in length; inner ½ in. long, connate, their tips ciliate and hardening round the achenes. *Anther-tails* fimbriate. *Achenes* ¼ in. long, obconic, densely silky. *Pappus* short, yellowish.

Fairly abundant throughout the area. Flowers during the hot season. DISTRIB. W. Bengal and on the Shan Hills in Upper Burma, Punjab Plain ascending to 5,000 ft. on the W. Himalaya, Afghanistan, Sindh, and throughout the Deccan.

41. CNICUS, Linn.; Fl. Brit. Ind. iii, 362.

Erect herbs. *Leaves* alternate, often decurrent, serrately toothed or pinnatifid, spinescent. *Heads* solitary, long-pedunculed or subsessile, scattered or crowded, homogamous. *Flowers* all hermaphrodite and fertile, rarely dicœcious, white yellow or red, tube slender; limb equal or oblique, 5-fid. *Involucre* ovoid hemispheric or globose; bracts many-seriate, appressed, erect spreading or recurved and spinescent, outer foliaceous. *Receptacle* flat or convex, densely bristly. *Filaments* hairy or glabrous. *Anther-bases* sagittate, auricles connate, tails slender. *Style-arms* short, rarely filiform, obtuse. *Achenes* obovoid, obtusely 4-angled, smooth or 5-10-ribbed, truncate or the top umbonate, basal areole nearly straight. *Pappus* copious,

rigid, feathery, deciduous with a basal ring.—Species about 150, all in N. temperate regions.

Heads dicœcious, flowers dull-purple, corolla-limb 5-partite	1. *C. arvensis.*
Heads 2-sexual, flowers yellowish, corolla-limb 5-fid	2. *C. Wallichii*, var. *fasciculata.*

1. C. arvensis, *Hoffm. Deutschl. Fl. ed. 2, i, II, 130; F. B. I. iii, 362; Watt E. D.; Collett Fl. Siml. 272.* Carduus lanatus, *Roxb. Fl. Ind. iii, 403.*

An erect leafy herb. *Stems* many from the perennial creeping root, 2-3 ft. high, not winged, usually simple, cobwebby tomentose above, the sexes forming separate tufts. *Leaves* sessile, 3-5 in. long, linear-oblong or obovate, sinuate or pinnatifid, scabrid above, white-tomentose or woolly beneath; lobes divergent, tipped with spines. *Heads* dicœcious, solitary fascicled or corymbose, those of the males globose, ½-1 in. in diam.; the fem. heads much longer and with more lax invol-bracts. *Involbracts* glabrate or cobwebby; outermost short, ovate or triangular-ovate, ending in a short spine; inner gradually longer, with undulate often recurved tips; innermost linear-lanceolate, scarious. *Corolla* dull purple, its limb 5-partite. *Achenes* smooth, shining. *Pappus* light brown.

An abundant weed within the area, especially on cultivated ground. Flowers Feb. to May. DISTRIB. Plains of Bengal and Punjab, W. Himalaya from Kumaon to Kashmir, ascending to 12,000 ft. in W. Tibet; also in China, and from W. and N. Asia to Europe. The seeds yield an oil, which is used by the poorer classes for burning.

2. C. Wallichii, *Hook. f. in F. B. I. iii, 363.*

Stem robust, branched, 4-10 ft. high, leafy; branches spreading, grooved. *Leaves* sessile, sinuate-pinnatifid, glabrous on both surfaces or cottony and tomentose beneath; lobes ending in a long slender rigid spine. *Heads* ¾-1¼ in. solitary and on naked peduncles or sessile and fascicled. Outer *invol-bracts* lanceolate, ending in appressed erect or recurved spines; inner longer, with spreading or recurved more or less dilated acute or spinescent tips. *Flowers* bisexual. *Corolla* 5-fid, ¾ in. long, yellow. *Pappus* brown.

The type of this very variable species has not been found within the area of this flora. Some of the varieties approach very closely to *C. argyracanthus.* It is a common Himalayan species and occurs also on the Nilgiri Hills.

VAR. fasciculata, *Hook. f. in F. B. I, iii, 364.* Very spinous. *Leaves* white-tomentose or cottony beneath. *Heads* fascicled. Inner *invol-bracts* with long lanceolate dilated spinescent tips—Dehra Dun (Royle, Jacquemont, Duthie).

42. SAUSSUREA, DC. Fl. Brit. Ind. iii, 365.

Annual biennial or perennial, glabrous or tomentose herbs of various habit. *Leaves* unarmed, alternate, entire toothed pinnatifid or pinnatisect. *Heads* narrow or broad, sometimes crowded on the dilated top of a simple stem, peduncled or sessile, solitary corymbose or panicled, homogamous. *Flowers* purple or bluish, all 2-sexual and similar, tube slender; limb narrow, 5-fid. *Involucre* ovoid oblong globose or hemispheric; *bracts* many-seriate, appressed, not spinescent, inner longer, narrower. *Receptacle* flat or convex, densely bristly, rarely naked. *Filaments* free, glabrous; *anther-bases* sagittate, auricles connate; tails usually long, entire, ciliate or woolly. *Style-arms* linear. *Achenes* glabrous, oblong, 4-ribbed, smooth or rugose; top truncate and cupular, or crowned with a thickened disk and the persistent base of the style; basal areole straight. *Pappus-hairs* 1-2-seriate, inner feathery, base thickened and connate into a deciduous ring, outer usually of rigid scabrid bristles, rarely feathery or 0.—Species about 100; chiefly in N. temperate regions, and on mountains in the tropics.

Heads broad, leaves lyrate-pinnatifid.

Outer invol-bracts obtuse; achenes smooth, 10-ribbed	1. *S. affinis.*
Invol-bracts all lanceolate-acuminate; achenes muricate, 5-angled . .	2. *S. candicans.*
Heads narrow, leaves entire or subpinnatifid .	3. *S. albescens.*

1. S. affinis, *Spreng. ex DC. Prod. vi, 540; F. B. I. iii, 373.* Serratula carthamoides, *Roxb.; Fl. Ind. iii, 407.*

Annual. *Stem* 2-8 ft. high and often very thick, grooved, glabrous or nearly so. *Leaves* lyrate-pinnatifid, white-cottony beneath; radical petioled, 4-8 in. long, membranous, glabrous or puberulous above; cauline sessile, uppermost sinuate-lobed or entire. *Heads* broad, on long grooved peduncles, arranged in large open panicled corymbs, 1 in. in diam. *Invol-bracts* glabrate, 5-nerved; outer ovate, obtuse or acute; inner lanceolate, acuminate, often tinged with purple. *Corolla* ½ in. long, very slender, pale-red. *Anther-tails* short, fimbriate. *Achenes* ⅛ in. obovoid, smooth, 10-ribbed, tip contracted. *Pappus-hairs* ½ in., very slender, white, outer 0.

Gorakhpur District (Duthie's collector). Flowers Feb. to May. DISTRIB. Bengal from Sylhet to the foot of the Nepal Hills; also in Burma, China, Japan and E. Australia.

2. **S. candicans.** *Clarke Comp. Ind. 232; F. B. I. iii, 373; Watt E. D.; Collett Fl. Siml. 274.* Aplotaxis scaposa, *Edgew. in Trans. Linn. Soc. xx, 76.*

Annual. *Stems* 2-5 ft. high, usually simple below, cottony. *Leaves* up to 18 in. long, oblong or obovate-oblong, entire or sinuate-toothed or lobed at the base or lyrate-pinnatifid, glabrous or pubescent above, cottony or white-tomentose beneath; cauline few, smaller, sessile lanceolate. *Heads* long-peduncled, 1-1½ in. in diam., arranged in large open panicled corymbs, or occasionally solitary. *Involucral-bracts* cottony or pubescent, lanceolate and with sharp acuminate points. Receptacle bristles long. *Corolla* upwards of ½ in. long, pale-red. Anther-tail lacerate. *Achenes* ¼ in., 5-angled, muricate. *Pappus-hairs* very slender, equalling the corolla, white; outer pappus 0.

A common weed in cultivated ground. DISTRIB. Plains of Bengal and Punjab, Salt Range, W. Himalaya from Hazara to Bhutan up to 6,000 ft.; also in Afghanistan and Baluchistan. A small scapose form with solitary heads is occasionally met with. The seeds are carminative and are collected in the Punjab.

3. **S. albescens.** *Hook. f. ex Clarke Comp. Ind. 233; F. B. I. iii, 374; Collett Fl. Siml. 274.*

A tall perennial herb, 6-10 ft. high. *Stems* erect, rigid, rather slender; simple below, branching near the top, more or less cottony or tomentose. *Leaves* variable in length and breadth, up to 12 in. long, acute or acuminate, entire sinuate-lobed or subpinnatifid, glabrous scabrid or cobwebby above, more or less cottony or tomentose beneath; lower petioled, narrowly oblong; upper ovate oblong-ovate or linear. *Heads* stalked, erect, narrow, 5-6-flowered, ½-¾ in. long, in copious long-peduncled terminal and axillary flat-topped corymbs. *Involucral-bracts* erect, glabrous or rarely cottony, rigid, usually with a purplish tinge; outer ovate, acute, inner lanceolate. *Receptacle* very narrow, bristles longer than the achenes. *Corolla* ¼ in. long, pale-red. *Anther-cells* fimbriate. *Achenes* narrow, 4-angled, muricate above, top much cupped. Inner *pappus* white, outer 0.

Dehra Dun (Gamble). Flowers Sep. and Oct. DISTRIB. Punjab Plain, and on the W. Himalaya from Kashmir to Nepal, ascending to 10,000 ft., also in W. Tibet.

43. GONIOCAULON, Cass.; Fl. Brit. Ind. iii, 377.

An erect glabrous branched annual; stem acutely 4-8-angled. *Leaves* narrow, alternate, toothed. *Heads* narrow, fascicled and corymbose, homogamous. *Flowers* few, all 2-sexual, fertile and similar, tube slender; limb longer, cylindric, 5-fid to the middle or lower. *Involucre* oblong, tapering to the base; *bracts* many-seriate, pale, very narrow, rigid, acute, erect, not spinescent; outer gradually shorter. *Receptacle* very narrow, paleaceous. *Filaments* hairy

anther-bases sagittate, connate, tails short. *Style-arms* filiform. *Achenes* glabrous, oblong, subcylindric, about 20-ribbed, basal areole straight. *Pappus-scales* many-seriate, very unequal.—A single species, confined to India.

G. glabrum, *Cass. in Bull. Soc. Philom. (1817), 34; F. B. I. iii, 377; Cooke Fl. Bomb. ii, 55.* Athanasia indica, *Roxb. Fl. Ind. iii, 417.*

A glabrous annual with a long straight tap-root. *Stem* 1-3 ft. high, rigid, hollow, sharply angled and striate between the angles, branched or simple below, corymbose above. *Leaves* sessile, 2-5 in. long, linear-oblong or subspathulate, dentate or serrate, narrowed to the base and ½-amplexicaul, both surfaces covered more or less with dark raised dots as in *Tricholepis*, setulose on the margins and with white cartilaginous teeth. *Heads* ½-¾ in. long, erect, narrow, pedicelled, fascicled in compound corymbs. *Involucre-bracts* lanceolate, acuminate, striate, often with coloured tips. *Flowers* 4-5 in each head, exserted, rose-purple. *Achenes* ¼ in. long. *Pappus-scales* linear or obovate, subobtuse their edges minutely ciliate.

Bundelkhand (Edgeworth, Duthie), Indore (Edgeworth). DISTRIB. W. Bengal, C. India, and the Deccan. Often gregarious.

44. TRICHOLEPIS, DC.; Fl. Brit. Ind. iii, 379.

Annual or perennial branched unarmed herbs. *Leaves* entire-toothed or the lower pinnatifid, often with raised dots on the surfaces. *Heads* terminal, solitary, pedunculed, homogamous. *Flowers* all 2-sexual, similar, fertile, yellow red or purple, regular or subobliqne, tube slender, limb 5-cleft to the middle. *Involucre* ovoid or broader; *bracts* many-seriate, very narrow, usually with long recurved hair-points or mucronate, the outer shorter. *Receptacle* densely bristly. *Filaments* papillose; *anther-bases* sagittate, auricles connate, tails slender, lacerate. *Style-arms* slender. *Achenes* glabrous, oblong or obovoid, smooth, ribbed, basal areole lateral. *Pappus-bristles* many-seriate and very unequal, serrulate, barbellate or feathery, long and slender, or short and paleaceous, or 0.—About 10 species in Afghanistan, India and China.

Stem elongate, slender, pappus scabrid not plumose	1. *T. glaberrima.*
Stem short or 0, pappus plumose . .	2. *T. stictophyllum.*

1. T. glaberrima, *DC. Prod. vi, 564; Dcne. in Jacquem. Voy. Bot. 99, t. 106; F. B. I. iii, 381; Watt E. D.; Cooke Fl. Bomb. ii, 56.*

Quite glabrous. *Stem* slender, erect, rigid, angled and ribbed. *Leaves* sessile, 2-3 in. long, linear-oblong or lanceolate, acute, entire or spinous-

toothed, scaberulous and covered with raised points, prominently nerved; cauline leaves sometimes auricled at the base. *Heads* ovoid, ½-⅔ in. in diam. *Involucral-bracts* suberect, subulate, bristle-pointed. Receptacle-bristles narrowly linear, exceeding the pappus. *Corolla* about ¼ in. long, purple. *Achenes* oblong, faintly ribbed, twice as long as the barbellate pappus.

Indore (Edgeworth) on black soil. Flowers in Oct. DISTRIB. Rajputana on Mt. Abu, Konkan, Deccan. The plant is used medicinally.

2. **T. Stictophyllum,** *Clarke Comp. Ind. 241; F. B. I. iii, 382; Duthie in Ann. R. Bot. Gard. Calc. ix 44, t. 56.* Stictophyllum glabrum, *Edgew. in Trans. Linn. Soc. xx, 78.*

A subscapigerous glabrous perennial herb. *Stem* none or short and woody, sparingly branched; branches angular, grooved, leafy below. *Leaves* ½-amplexicaul, 3-5 in. long, linear or ligulate, acute, flat, entire or obscurely toothed, covered with minute raised points, nerves parallel to midrib. *Heads* 1-1½ in. in diam., solitary or two together at the ends of the almost leafless branches. *Involucral-bracts* glabrous or somewhat cottony; outer ovate, acuminate; inner linear-lanceolate with erect flexuous tips. *Corolla* ¾ in. long, pale-purple. *Receptacle-bristles* longer than the achenes. *Achenes* ¼ in. long, linear-oblong, truncate, compressed, many-ribbed, rather dilated at the apex, basal areole very oblique. *Pappus* plumose, ¼ in. long, silvery-brown, the hairs slightly united at the base.

Dehra Dun and Siwalik range (Falconer, Edgeworth), Sub Himalaya-tracts in the N. Oudh districts of Kheri and Bahraich and in Gorakhpur (Duthie's collector), Saugor, in C. India (Jerdon). Flowers during March and April. DISTRIB. Mandla district in the Cent. Prov. and on the Shan Hills in Upper Burma.

45. VOLUTARELLA, Cass.; Fl. Brit. Ind. iii, 383.

Annuals. *Leaves* alternate. *Heads* heterogamous, purple-violet or blue. *Outer flowers* 1-seriate, neuter. *Disk-flowers* 2-sexual, fertile; tube slender, short; limb cylindric, 5-fid. *Involucre* ovoid or globose; *bracts* many-seriate; innermost narrow, acute; outer shorter, acute, awned or spinescent. *Receptacle* flat, densely bristly. *Filaments* glabrous or hairy, anther-bases sagittate; auricles connate, shortly tailed. *Style* filiform, arms free or connate. *Achenes* obovoid or oblong, subulate or angled, 5-15-ribbed, often striate and pitted between the ribs; basal areole oblique or lateral. *Pappus-bristles* many-seriate, outermost gradually shorter; innermost 2-4, dilated and flattened.—Species 4 or 5; in S. Europe, N. Africa, W. Asia, and India.

V. divaricata, *Benth. & Hook. f. Gen, Pl. ii, 476 (in part); F. B. I. iii, 383; Watt E. D.; Cooke Fl. Bomb. ii, 57.* Microlonchus divaricatus, *DC.; Royle Ill. 246.*

A straggling stiff annual, dichotomously branched, glabrous or scaberulous; branches 1-2 ft. long, spreading, angled. *Leaves* very variable, sessile, 1-2 in. or longer, oblong or obovate, entire toothed or pinnatifid; lobes rounded and mucronate, often undulate or crisped. *Heads* ½-1 in. long, ½-⅔ in. in diam., glabrous or cottony-pubescent. *Invol-bracts* ovate or elliptic-oblong, with a long spinescent awn, the outer spreading or recurved the inner erect. *Pales* of receptacle short. *Corolla* ¼ in. long, pale-purple; lobes linear, acute. *Achenes* ¼ in., acutely angled, grooved and punctate between the angles, base narrow, areole small, top broad and truncate. *Pappus* of many unequal scaberulous silvery brown hairs.

Common in all parts of the area on river-banks and on waste ground, especially where the soil is sandy. Flowers from Nov. to April. DISTRIB. Chota Nagpur, Punjab Plain, Sindh, and south to the Konkan, the Central Provinces and S. India; also in Afghanistan and Baluchistan. The plant is imported into Bombay and sold as a drug.

46. LEUCOMERIS, Don.; Fl. Brit. Ind. iii, 386.

Shrubs or small trees. *Leaves* alternate, broad, quite entire. *Heads* corymbose, homogamous, discoid, 4-8-flowered, white. *Flowers* all 2-sexual, similar and fertile, tubular; segments 5, narrow, revolute. *Involucre* much shorter than the flowers, ovoid; *bracts* many-seriate, ovate or lanceolate, coriaceous or dry, outer smaller. *Receptacle* flat, naked. *Anther-bases* sagittate, auricles connate, tails ciliate. *Style* filiform, obtuse, 2-fid. *Achenes* oblong, subterete, 5-ribbed, silky. *Pappus* copious, hairs very slender, scabrid, outer shorter.—Species 2, both Indian.

L. spectabilis, *Don Prod. 170; Royle Ill. 247; F. B. I. iii, 386; Kanjilal For. Fl. Sch. Circ. 209; Gamble Man. 423.*—Vern. *Phusiári, phusára.*

A large shrub or small tree with white corky bark; branches stout, grooved. *Leaves* shortly petioled, 4-14 in. long, elliptic or elliptic-lanceolate or oblanceolate, coriaceous, glabrous above, densely white-tomentose beneath, *petioles* dilated at the base. *Heads* ½-1 in. long, arranged in large bracteolate tomentose corymbs. *Invol-bracts* few, nearly flat; inner linear-lanceolate, acute; outer shorter, with many smaller distant ones on the pedicels below. *Corolla* 1 in. long, white. *Achenes* ⅛-¼ in., slender, densely silky. *Pappus* ½ in. long, rigid, pale-yellow.

Siwalik range (Royle): Dehra Dun, at Bulawala (Kanjilal). Flowers during April and May. DISTRIB. W. Himalaya, from Garhwal to Nepal, up to 6,000 ft.

47. DICOMA, Cass.; Fl. Brit. Ind. iii, 387.

Herbs or low shrubs. *Leaves* alternate. *Heads* subsessile on the branches, rarely corymbose, white or purple, homogamous, discoid. *Flowers* all 2-sexual or heterogamous with the outer flowers female and all fertile, or the innermost sterile, tubular, limb 5-partite, segments erect or revolute; female (if present) slender and with a short ligule. *Invol-bracts* many-seriate, ovate-lanceolate, or linear, acuminate or spinescent, outer shorter. *Receptacle* flat, naked, often pitted. *Anther-bases* sagittate, tails long, bearded. *Style-arms* short, erect, obtuse. *Achenes* turbinate, densely villous, 5-10-ribbed. *Pappus-hairs* many-seriate, inner or all flat, scabrid bearded or feathery; outer shorter, paleaceous or of slender bristles.—Species 13; in Trop. and S. Africa, one of which extends to India.

D. tomentosa. *Cass. in Bull. Soc. Philom. (1818) 47; F. B. I. iii, 387; Watt E. D.; Cooke Fl. Bomb. ii, 53.* D. lanuginosa, *DC.; Royle Ill. 248.*

An erect much-branched herb, 6-18 in. high. *Stem* woody at the base, terete; branches also terete, clothed with white woolly pubescence or finally glabrous and tinged with red. *Leaves* sessile, 1-3 in., linear or linear-obovate, obtuse or acute, apiculate, densely white-tomentose on both sides; margins entire or minutely spinescent. *Heads* many, solitary, subaxillary and terminal, glabrous. *Invol-bracts* ¼-½ in. linear-lanceolate, spinescent, shining. *Corolla* ¼ in., white or pale-yellow. *Achenes* ¼ in. long, turbinate, truncate, densely silky. *Pappus* longer than the achenes; outer bristles slender; inner longer, paleaceous.

Jumna and Chambal ravines in the districts of Agra, Delhi, and Etawah; also at Dholpur, and in the district of Ajmere. Flowers during the cold season. DISTRIB. Punjab Plain, Sindh, and W. Peninsula; also in Trop. Africa. A preparation from this plant is used in Belgaum as a febrifuge.

48. CATAMIXIS, Thoms.; Fl. Brit. Ind. iii, 389.

An erect undershrub. *Leaves* alternate, petioled, obovate or oblong, obtusely serrate. *Heads* small, narrow, in a broad terminal corymb, yellow, homogamous, few-flowered. *Flowers* all 2-sexual, similar, ligulate and fertile. *Involucre* oblong; *bracts* few, many-seriate, lanceolate, acute, outer shorter. *Receptacle* small, naked. *Anther-bases* sagittate; tails elongate, barbellate. *Style* filiform, obtuse; arms very short, erect. *Achenes* narrowly turbinate, silkily villous. *Pappus-hairs* sub-2-seriate, slender, scabrid, outer shorter. —A single species, confined to N. India.

This genus, in respect to its flowers, may be considered as forming a connecting link with the *Cichoriaceæ*. In habit it much resembles *Baccharis*, a South American genus belonging to the tribe *Asteroideæ*.

C. baccharoides, *T. Thoms. in Journ. Linn. Soc. ix (1865), 343, t. 4; F. B. I. iii, 389; Kanjilal For. Fl. Sch. Circ. 210.*

An undershrub up to 3½ ft. high. *Branches* terete, appressedly silky. *Leaves* 2-3 in. long, obovate-spathulate, distantly crenate or crenate-serrate except along the gradually tapering ½-amplexical base, coriaceous, glabrous, nerves prominent. *Heads* ½ in. long, arranged in broad terminal dichotomously branched corymbs; branches slender, puberulous, suberect in the axils of minute bract-like leaves. *Involucre* much shorter than the flowers. *Corolla* ½ in., yellow, *ligules* spreading. *Achenes* 1/5 in. long, turbinate or obovate-oblong, clothed with long silky hairs; basal areole lateral. *Pappus* ½ in., white.

In rock-crevices on the Siwalik range (Royle, Falconer, Stewart, Edgeworth, Kanjilal, Duthie), not known to occur elsewhere. Flowers during Dec. and Jan.

49. CREPIS, Linn.; Fl. Brit. Ind. iii, 393.

Annual or perennial glabrous or hairy herbs, hairs never stellate. *Leaves* radical or alternate; cauline often stem-clasping, entire toothed or pinnatifid. *Heads* pedunculed, solitary fascicled or corymbose, yellow or red, homogamous. *Flowers* all ligulate. *Involucre* cylindric or campanulate; *bracts* either many-seriate and regularly imbricate, or the outer small or very much shorter than the linear 1-seriate inner; base or midrib sometimes thickened after flowering. *Receptacle* flat, rarely concave, naked or shortly fimbrillate. *Achenes* more or less fusiform or oblong, rarely short and cylindric, often slender, glabrous or scaberulous, 10-20-ribbed, tip narrowed or beaked. *Pappus* short or long, usually copious, hairs usually silvery, simple and soft, rarely brownish and stiff or brittle.—Species about 130; in N. temperate regions of the Old World, and on mountains in the tropics.

Annual, flowering stems long and slender .	1. *C. japonica.*
Perennial, flowering stems usually shorter than the leaves	2. *C. acaulis.*

1. C. japonica, *Benth. Fl. Hongk. 194; F. B. I. iii, 395; Collett Fl. Siml. 281.*

Annual, glabrous or puberulous. *Leaves* mostly radical and rosulate, petioled, 2-6 in. long, obovate, sinuate-toothed or runcinate-pinnatifid, membranous; cauline few and smaller. *Flowering stems* 6-18 in., slender, erect, nearly naked, soft, corymbosely branched near the apex.

Heads ½-¾ in. on slender spreading bracteolate peduncles. *Invol-bracts* 6-8, narrowly oblong, glabrous, recurved when in fruit, margins hyaline. *Flowers* pale-yellow. *Achenes* narrowly fusiform, compressed, ribbed and minutely rugose, reddish.

Common within the area. DISTRIB. Throughout India and in Ceylon, ascending to 10,000 ft. on the Himalaya; also in China, Japan, and Australia, and in S. Africa and Mauritius as an introduction.

2. **C. acaulis**, *Hook. f. in F. B. I. iii, 396;* Prenanthes acaulis, *Roxb. Fl. Ind. iii, 403.*

A glabrous stemless perennial herb. *Root* woody, straight, cylindric. *Leaves* chiefly radical, 2-12 in. long, lanceolate linear or narrowly obovate-spathulate, obtuse or acute, entire sinuate-toothed or, sub-pinnatifid; nerves spreading, faint. *Scape* 4- or 5-flowered, usually shorter than the leaves, 3-10 in. long, simple or dichotomously branched. *Heads* few, 1 in. long, 10-12-flowered; peduncle bracteolate. Outer *invol-bracts* very small; inner linear, the margins hyaline. *Flowers* yellow, pedicelled. *Achenes* ¼ in. ellipsoid, subcompressed, shorter than the soft silvery pappus, ribs smooth.

Siwalik range (Edgeworth), Dehra Dun (Duthie), N. Oudh, in the Kheri and Bahraich districts and in Gorakhpur (Duthie's collector). DISTRIB. Subtropical Himalaya from Jamu to Bhutan, Bengal, Cent. and S. India, Shan Hills in Upper Burma.

50. LACTUCA, Linn.; Fl. Brit. Ind. iii, 402.

Glabrous or hispid milky herbs. *Leaves* radical and alternate, entire, toothed, pinnatifid or pinnate; cauline often stem-clasping and auricled. *Heads* sessile or peduncled, panicled, corymbose, racemose or subspicate, homogamous, yellow purple or blue. *Flowers* all ligulate. *Involucre* usually narrow; *bracts* usually few-seriate, thinly herbaceous, margins often membranous; inner slender, subequal, outer often very short. *Receptacle* flat, naked. *Anther-bases* sagittate, rarely tailed. *Achenes* compressed or flattened, ovoid-oblong or narrow, beaked, faces 3-many-ribbed; ribs slender or strong, smooth or rugose, the middle one often the strongest; *beak* slender, or short and cylindric, dilated into an entire or toothed pappiferous disk. *Pappus* copious, hairs very slender, simple, usually soft and white, but very variable, persistent or separately deciduous, sometimes with a minute outer ring.—Species about 60; in N. temperate regions, and on mountains within the tropics.

Leaves mostly radical, heads in spikes or racemes on the long erect, almost naked flowering stems.

Heads sessile or nearly so, solitary or fascicled, leaves runcinate-pinnatifid . . . . 1. *L. runcinata.*

Heads pedunculed, usually solitary. A more slender plant with smaller and often nearly entire leaves	2. *L. remotiflora*.
Flowering stems leafy.	
Heads in corymbs, ligules blue . . .	3. *L. dissecta*.
Heads subumbellate, ligules yellow . .	4. *L. polycephala*.

1. L. runcinata, *DC. in Wight Contrib. 26; Cooke Fl. Bomb. iii, 60.* L. Heyneana, *DC.; F. B. I, iii, 403.* Prenanthes racemosa, *Roxb. Fl. Ind. iii, 405.*

A tall annual or biennial glabrous herb, 1-4 ft. high. *Stem* hollow below, often stout and much branched. *Leaves* sessile, runcinate-pinnatifid, finely spinulose or ciliate-toothed, membranous; radical 6-12 in. long, very irregularly pinnatifid; cauline few, narrower, ½-amplexicaul and auricled. Flowering stems slender, branches erect, *Heads* sessile or nearly so, ½ in. long, bracteolate, solitary or fascicled on the long leafless ascending branches. Outer *invol-bracts* few, ovate, acute, with broad scarious margins; inner with thickened ribs when in fruit. *Flowers* spreading, yellow. *Anther-bases* shortly acuminate. *Achenes* ⅛ in., shortly beaked, oblanceolate, muricate, black. *Pappus* flexuous, silvery, twice as long as the achene.

Banks of the Jumna and Chambal rivers in the districts of Agra and Etawah (Munro, Duthie), Banda and (Edgeworth), Ajmir (Duthie). DISTRIB. Punjab, and Sindh to W. S. India and Ceylon. The plant is much eaten by cattle.

2. L. remotiflora, *DC. in Wight Contrib. 26; F. B. I. iii, 403; Watt E. D.; Cooke Fl. Bomb. ii, 60.*

A smaller and more delicate plant than *L. runcinata*, with smaller obovate and nearly entire rarely pinnatifid radical leaves. Flowering stems less branched. *Heads* usually solitary on the naked branches, distinctly pedunculed. *Achenes* ⅛ in., nearly as long as the soft silvery persistent pappus.

Banda (Edgeworth). DISTRIB. Sindh, Deccan; also in Arabia. The plant is said to be used at Goa as a substitute for *taraxacum*.

3. L. dissecta, *Don. Prod. 164; F. B. I. iii. 405; Collett Fl. Siml. 284.* L. arvensis, *Edgew. in Trans. Linn. Soc. xx, 79.*

An annual, glabrous or pubescent. *Stem* 3-18 in. high, dichotomously branched from the base, branches slender and leafy, or the stems simple and leafy below. *Leaves* 1-4 in., very variable, entire, lyrate, runcinate-pinnatifid or sometimes almost bipinnatifid, lobes entire or toothed; radical usually many, sessile or petioled; cauline ½-amplexicaul, and with auricled bases, uppermost linear. *Heads* ¼-½ in. long, corymbose, erect, narrowly cylindric, pedunculed very slender. Outer *invol-bracts* minute, ovate, inner linear. *Ligules* blue. *Achenes* ¼ in.

oblanceolate, transversely rugose, 3-ribbed on the faces, beak twice as long as the body. *Pappus* ½ in., white.

Siwalik range (Duthie), Dehra Dun (Gamble). DISTRIB. Punjab on the Salt range, and on the Himalaya from Kashmir and W. Tibet to Bhutan, ascending to 8,000 ft.; also in Afghanistan and Baluchistan.

4. L. polycephala, *Benth. & Hook. f. Gen. ii, 528; F. B. I. iii, 410.*

A slender glabrous flaccid annual, 6-18 in. high. *Radical leaves* petioled, 3-10 in. long, linear or lanceolate, entire, sinuate-toothed or pinnatifid narrowed to the base; cauline sessile, oblong or lanceolate, finely acuminate, usually broader than the radical, sagittate at the base with acute auricles. Flowering stems simple or branched. *Heads* erect, ¼-½ in. in diam., many-flowered, arranged in dichotomous or sub-umbellate corymbs. Outer *involucre-bracts* minute; inner 6-10, linear-oblong, green. *Ligules* yellow. *Achenes* elliptic-lanceolate, hardly compressed, smooth, narrowed into a short slender beak, smooth, 10-ribbed. *Pappus* ½ in. silvery.

Dehra Dun (Gamble), Moradabad (T. Thomson), in wet places. DISTRIB. Punjab Plain, Bengal, and up to 6,000 ft. on the Himalaya from Kashmir to Sikkim also on the Khasia, Hills and in Upper Burma extending to China, and Afghanistan.

The garden lettuce (Lactuca sativa, L.) is the cultivated variety of *L. Scariola*, L., a tall and somewhat prickly herb which is found wild on the W. Himalaya and in Europe. It is grown to a large extent throughout India, but chiefly for the use of the European population.

51. PICRIDIUM, Desf.; Fl. Brit. Ind. iii, 413.

Perennial or annual glabrous milky herbs. *Leaves* radical or alternate, toothed or pinnatifid, with often crisped and toothed or spinulose lobes. *Heads* campanulate, yellow, homogamous. *Flowers* all ligulate. *Involucre* campanulate; bracts many-seriate, thinly herbaceous; innermost subequal, lanceolate, unchanged in fruit; outer shorter, broader, with scarious margins. Receptacle flat, naked. *Achenes* oblong, truncate at both ends, constricted at the tip; ribs 4-5, thick, transversely rugose. *Pappus*-hairs many-seriate, slender, simple, soft, white, connate at the base into a deciduous ring.—Species 5 or 6, in Europe, N. Africa and W. Asia.

P. tingitanum, *Desf. Fl. Atlant. ii, 220; F. B. I. iii, 413.*

An annual 6-18 in. high, with a stout glabrous stem. *Leaves* 1-5 in. long, variable in breadth; radical elongate-obovate or spathulate, obtuse, sinuate-toothed or pinnatifid, denticulate, rarely entire; cauline ½-amplexicaul, auricled. *Heads* 1½ in. in diam., on peduncles thickened

upwards. *Invol-bracts* cordate, with very broad membranous margins and thickened tips, inner oblong. *Achenes* $\frac{1}{12}$ in. long, 4-angled, or of 4 moniliform ribs, pale and corky. *Pappus* $\frac{1}{4}$ in. very soft, and white.

Etawah district (A. O. Hume, Duthie), Fattehgarh (Edgeworth), Ajmir (Jacquemont). DISTRIB. Punjab, on Mt. Tilla (Aitchison), Punjab Plain (Jacquemont, Stewart); also in Baluchistan and Afghanistan, extending to S. Eur., N. Africa and the Canary Islands. Jacquemont's Ajmir specimens (var. *subintegra* in F. B. I. l.c.) with tall stout stems and almost entire leaves probably represent, as Sir Joseph Hooker suggests, a luxuriant state of this species growing in rich soil.

52. SONCHUS, Linn.; Fl. Brit. Ind. iii, 413.

Annual or perennial milky herbs. *Leaves* radical or alternate cauline often stem-clasping, entire toothed or pinnatifid, segments often spinulose-toothed. *Heads* terminal, irregularly subcorymbose umbellate or panicled, yellow, homogamous. *Flowers* all ligulate. *Involucre* ovoid, campanulate or cylindric, often dilated thickened and conic at the base; *bracts* many-seriate, herbaceous, outer smaller. *Receptacle* flat, naked. *Achenes* ovoid obovoid or ellipsoid, compressed, not beaked, ribbed, ribs smooth or transversely rugose. *Pappus* copious, hairs many-seriate, very slender, simple, usually white and united at the base into a deciduous ring.—Species about 24; in N. temperate regions and C. Asia, occurring often in other countries as introductions.

Auricles of cauline leaves spreading, acute	1. *S. oleraceus.*
Auricles of cauline leaves appressed, obtuse.	
Invol-bracts without gland-tipped hairs; achenes much compressed, not transversely rugose	2. *S. asper.*
Invol-bracts gland-hairy; achenes slightly compressed, transversely rugose	3. *S. arvensis.*

1. S. oleraceus, *Linn. Sp. Pl. 794; Roxb. Fl. Ind. iii, 402; Royle Ill. 247; F. B. I. iii, 414; Watt E. D.; Collett Fl. Siml. 287; Cooke Fl. Bomb. ii, 61.*

An erect annual, 2-3 ft. high, glabrous or sparsely glandular-hispid. *Stem* subumbellately branched above, glaucous. *Leaves* thin, 6-10 in. long, lanceolate, entire, or pinnatifid and with the terminal lobe large and the lateral lobes pointing downwards, teeth small; the base $\frac{1}{4}$-amplexicaul and with acute spreading auricles. *Heads* $\frac{3}{4}$-1 in. in diam., arranged in umbellate cymes. *Invol-bracts* glabrous or nearly so. *Achenes* $\frac{1}{8}$ in., compressed, narrowly obovoid, the faces 3-ribbed and muriculate between the ribs.

Abundant within the area, especially on cultivated ground. Flowers after the cold season. DISTRIB. Throughout India, and up to 8,000 ft. on the Himalaya; also in China, and in many temperate and tropical countries, but often introduced. The root and leaves are used medicinally, and the latter sometimes as a vegetable. Cattle are very fond of this plant.

2. **S. asper**, *Hill Herb. Brit. i, 47; F. B. I. iii, 414; Collett Fl. Siml. 237; Cooke, Fl. Bomb. ii, 62.*

An annual, 2-3 ft. high, glabrous or sparsely glandular above. *Leaves* 6-10 in. long; cauline lanceolate or elliptic-oblong, entire runcinate or pinnatifid, ½-amplexicaul at the base; auricles rounded, appressed, the margins undulate and dentate or spinous-dentate. *Heads* crowded in umbel-like cymes, ¾-1 in. in diam. *Involucre-bracts* glabrous. *Achenes* compressed, the faces 3-ribbed, not or only faintly rugose between the ribs.

Not so abundant as the preceding, but occurring in similar localities. Flowers during the cold season. DISTRIB. Widely distributed in India, and on the Himalaya up to 12,000 ft.; also in China and in many temperate and tropical countries, but often introduced.

3. **S. arvensis**, *Linn. Sp. Pl. 793; Royle Ill. 247; F. B. I. iii, 414; Watt E. D; Collett Fl. Siml. 238; Cooke Fl. Bomb. ii, 62.* S. orixensis *Roxb. Fl. Ind. iii, 402.*

A perennial, with a creeping and stoloniferous rootstock. *Stem* 2-4 ft., hollow, angular, umbellately branched and glandular-hairy above. *Leaves* mostly radical, runcinate-pinnatifid, spinous-toothed; cauline amplexicaul, with aporessed rounded auricles; uppermost leaves linear. *Heads* few, 1-2 in. in diam., umbellately corymbose; *peduncles* and *involucre-bracts* gland-hispid. *Achenes* narrow, slightly compressed, prominently ribbed on each face and transversely rugose. *Pappus* very white.

Dehra Dun, and probably throughout the Sub-Himalayan tracts eastwards. Flowers during the cold season. DISTRIB. Sparingly throughout the plains of India, more abundant on the hills, ascending to 8,000 ft. on the Himalaya; also in China and in most temperate and many tropical countries, either wild or introduced. The plant is used medicinally in many parts of India, and cattle are very fond of eating it.

58. LAUNÆA, Cass; Fl. Brit. Ind. iii, 414.

Perennial glabrous herbs, often with yellow juice. *Leaves* chiefly radical, sinuate-lobed or pinnatifid, margins often spinulose-toothed. *Heads* homogamous, peduncled, or lateral and sessile on the branches, racemose or paniculate, or solitary or in fascicles, yellow. *Flowers* all ligulate. *Involucre* campanulate or cylindric; *bracts* many-seriate, herbaceous, margins often membranous, inner subequal, outer various,

keel often thickened in fruit. *Receptacle* flat, naked. *Anther-bases* sagittate, auricles setaceous. *Style-arms* slender. *Achenes* narrow, subterete angled or slightly flattened, rarely winged, truncate at both ends or rarely emarginate; ribs 4-5, very stout, close-set, smooth papillose or narrowly winged or 2-grooved, truncate at each end. *Pappus* copious, hairs many-seriate, simple, very slender, white, a few inner sometimes longer and stronger, all connate at the base into a deciduous ring.—Species about 20; Mediterranean region, Canary Islands, W. Asia to India.

Heads terminal on the paniculately branched flowering stems	1. *L. asplenifolia.*
Heads more or less racemose on the flowering stem and its branches	2. *L. nudicaulis.*

1. L. asplenifolia, *Hook. f. in F. B. I. iii, 415; Watt E. D.* Prenanthes aspleniifolia, *Roxb. Fl. Ind. iii, 404.*

Biennial or perennial, glabrous. *Leaves* sessile or shortly petioled, 3-6 in. long, narrowly obovate, sinuate-lobed or pinnatifid, lobes minutely toothed, the teeth rarely white and cartilaginous; cauline leaves few. *Flowering stems* 6-18 in. long, many from the root, almost naked, branches dichotomously divaricating. *Heads* ½ in., terminal, paniculate, the peduncles with usually 1 or 2 subulate bracts. *Involucral-bracts* quite glabrous; outer small, inner linear, margins membranous. *Achenes* ⅛ in., columnar, angled and ribbed, ribs rough. *Pappus* ½ in., deciduous.

Common within the area, especially in cultivated ground. Flowers during the cold season. DISTRIB. Plains of Punjab and Bengal, and southwards to the Circars; also in the Andaman Islands and in Burma. The root is used medicinally.

2. L. nudicaulis, *Hook. f. in F. B. I. iii, 416; Collett Fl. Siml. 288; Cooke Fl. Bomb. ii, 63.* Microrhynchus nudicaulis, *Less.* Prenanthes procumbens, *Roxb. Fl. Ind. iii, 404.* Lactuca obtusa, *Clarke Comp. Ind. 261.*

Glabrous, biennial or perennial, with yellow juice. *Flowering stems* usually many, 6-24 in. long, spreading on all sides, simple or branched, naked or with a few small leaves below the clusters of flowers. *Leaves* usually sessile, 2-10 in. long, sinuate-lobed runcinate or pinnatifid; lobes irregularly lobulate and sharply toothed, the teeth usually white and cartilaginous. *Heads* ½-¾ in. long, sessile, narrow, in terminal and subracemose clusters, rarely solitary. *Pedicels* scaly with small bracts. *Involucral-bracts* overtopping the pappus, with white membranous margins; outer shortly ovate; inner long, linear, with the midrib thickened in fruit. *Achenes* ⅛ in., columnar, thickly ribbed, outer ones compressed, much shorter than the soft white pappus.

Abundant within the area. Flowers during the cold season. DISTRIB. Plains of Bengal and Punjab and southwards through Sindh to the

Deccan; W. Himalaya up to 8,000 ft. in Kumaon; also in Waziristan and Afghanistan and westwards to the Atlantic. The plant is used medicinally in the Punjab.—

The following cultivated plants belonging to non-indigenous genera should be briefly mentioned:—

Aster Amellus, L. (Michælmas Daisy) is cultivated in gardens.

Brachycome iberidifolia, Benth., called "Swan River Daisy" in Australia, is much grown as an ornamental annual.

Callistephus hortensis, Cass. (German or Chinese Aster.)

Helianthus annuus, L., is the common Sunflower, a native of the W. States of S. America. It is largely grown within the area both as an ornamental plant and for the sake of the oil yielded by its seeds. See Watt's Dictionary for further particulars.

Helianthus tuberosus, L. (Jerusalem Artichoke) is grown extensively as a vegetable, but chiefly for the use of the European inhabitants. It is a native of N. America.

Guisotia abyssinica, Cass.; F. B. I. iii, 308; Watt. E. D. Verbesina sativa Roxb.; Fl. Ind. iii, 441. Vern. *Ram-tili*. Cultivated in Bundelkhand and in the district of Mirzapur. A valuable oil is obtained from the seeds. The plant is a native of Trop. Africa.

Coreopsis spp. from N. America and S. Africa are grown in many gardens as ornamental annuals; also *Cosmos bipinnatus*, Cav. a native of Mexico. Closely allied to the latter is the Dahlia (*D. variabilis*, Desf.), which is now completely naturalized at Mussoorie, and in the neighbourhood of other hill-stations on the W. Himalaya.

Tagetes erecta, L. (African Marigold) and *T. patula*, L. (French Marigold), both from Mexico, are largely grown within the area, especially in the gardens of Hindus. The vernacular name is *genda*.

Gaillardia spp. from the Southern States of N. Amer. are cultivated as ornamental annuals in many gardens, also *Calendula officinalis*, L. (Common Marigold), a native of Europe.

Chrysanthemum sinense, Sabine, a native of China and Japan, is the origin of the countless garden varieties of the well-known *Chrysanthemum*. It thrives remarkably well in N. India, and flowers during the early part of Nov. Other kinds cultivated within the area are *C. indicum*, L., also from China and Japan; *C. coronarium*, L. introduced from the Mediterranean region, and *C. Leucanthemum*, L., the Ox-eye Daisy.

Cynara Scolymus, L., is the Globe Artichoke, a tall thistle with large handsome flower-heads. The heads are boiled when young, the thick bases of the involucre-bracts and the fleshy receptacle constituting the edible portions. *C. Cardunculus*, L., of which the above is a cultivated form, is a native of the Mediterranean region.

Centaurea Cyanus, L. (Corn Blue-bottle) and *C. moschata* L. (Sweet Sultan) are grown as ornamental plants.

Carthamus tinctorius, L.; Roxb. Fl. Ind. iii, 400; Royle Ill. 247; F. B. I. iii, 386; D C. L'Orig. Pl. Cult. 130; Duthie & Fuller, Field and Gard.Crops i, 51, t. xiii; Watt. E. D.; Cooke Fl. Bomb. ii, 68. Vern. *Kusum* (Safflower). A glabrous thistle-like herb with orange-red flowers. It is cultivated during the cold season in many parts of the area, but chiefly in the Meerut and Rohilkhand divisions. The flowers yield a beautiful pink dye, and from the seeds a valuable oil is obtained. Its native country is not known for certain, as it has never been found in a wild state. A. DeCandolle mentions that the clothing of Egyptian mummies were coloured with the safflower dye, and suggests that it may have originated in Arabia.

Cichorium Intybus, L.; F. B. I. iii, 391; D C. L'Orig. Pl. Cult. 77; Duthie & Fuller, Field and Gard. Crops iii, 48, t. lxxix; Watt E. D.; Collett Fl. Siml. 279. Vern. *Kasni*, (Chicory or Succory).—An erect more or less hispid perennial herb with bright blue or white ligulate flowers arranged in terminal and axillary heads. It is cultivated to a certain extent within the area and in the Punjab Plain, and is occasionally met with as an escape. It is truly wild in Europe and is believed to be indigenous also on the W. Himalaya. *C. Endivia*, L., is the Garden Endive.

Taraxacum officinale, Wigg.; F. B. I. iii, 401; Watt E. D.; Collett Fl. Siml. 283, Cooke Fl. Bomb. ii, 69 (Dandelion).—Very common throughout the Himalaya, extending from the temperate to the Alpine region. This plant has been grown for many years in the Saharanpur garden as a winter crop for supplying the Medical depots in India with *taraxacum* extract.

LXII.—CAMPANULACEÆ.

Herbs or undershrubs, sometimes twining, often with milky juice. *Leaves* alternate or opposite, entire or toothed, rarely lobed, exstipulate; the uppermost reduced to small bracts. *Inflorescence* axillary or terminal, solitary subpanicuiate or racemose; *bracteoles* 0 (except in *Sphenoclea*). *Calyx* inferior or superior; limb 4-6-part., usually persistent. *Corolla* always superior, regular or irregular, tubular rotate or campanulate, lobes valvate in bud. *Stamens* 4-6, alternating with the corolla-lobes, inserted with the corolla on the margin of the epigynous disk (in *Sphenoclea* on the corolla-tube); *anthers* free or united in a tube. *Ovary* 2-5-celled; placentas in the inner angle of the cell, many-ovuled. *Style* cylindric, stigma-lobes as many as the ovary-cells. *Fruit* capsular or baccate (in *Sphenoclea* spuriously circumscissa). *Seeds* many, small, ellipsoid, albuminous.—Species exceeding 1,000, throughout the world..

Corolla 2-lipped; anthers connate. . . 1. LOBELIA.

Corolla regular, anthers free or nearly so.
- Capsule loculicidally 2-3-valved, flowers in panicles . . . 2. WAHLENBERGIA.
- Capsule circumscissile, flowers in a dense spike . . . . . 3. SPHENOCLEA.
- Capsule dehiscent at the base or sides below the calyx-teeth . . 4. CAMPANULA.

1. LOBELIA, Linn.; Fl. Brit. Ind. iii, 423.

Herbs, often tall, or (non-Indian species) shrubs. *Leaves* alternate, toothed, rarely subentire. *Peduncles* axillary, 1-flowered, sometimes subracemose. *Calyx* superior, limb 5-partite. *Corolla* oblique, 2-lipped; upper lip 2-partite, lower 3-lobed. *Staminal-tube* free or nearly so; *anthers* tipped with bristles, 3 upper naked. *Ovary* inferior, 2-celled; *placentæ* hemispheric; *ovules* numerous; *stigma* shortly bifid. *Capsule* loculicidally 2-valved within the calyx-teeth. *Seeds* very many, minute, ellipsoid, compressed of trigonous.—Species about 200, in temperate and warm regions of the world, rare in Europe and W. Asia.

- Seeds distinctly 3-gonous, anthers all bearded at the tip . . . . . 1. *L. trigona.*
- Seeds ellipsoid, compressed, not trigonous; only two of the anthers bearded at the tip . . . . . 2. *L. trialata.*

1. L. trigona, *Roxb. Hort. Beng. 85; Fl. Ind. i, 506; F. B. I. iii, 423; Watt E. D.; Cooke Fl. Bomb. ii, 72.*

A glabrous annual, up to 12 in. high; branches ascending, rooting only near the base, more or less 3-angled. *Leaves* subsessile, ½-¾ in. long, ovate, acute, denticulate. *Flowers* axillary, longer than the leaves, with stipule-like bracts at the base. *Calyx-lobes* linear, about as long as the tube. *Corolla* ½-¼ in. long, pale-violet, lobes ovate-elliptic. *Anthers* all bearded at the tip. *Capsule* ¼ in., ellipsoid. *Seeds* narrowed at both ends, distinctly 3-gonous.

Dehra Dun (Gamble), Guna (King). Flowers after the rains. DISTRIB. From C. and S. India to Ceylon, also in Bengal and Burma. It is said to be eaten as a pot-herb in Chota Nagpur.

2. L. trialata, *Buch.-Ham. in Don Prod. Nep. 157; F. B. I. iii, 425; Collett Fl. Siml. 289; Cooke Fl. Bomb. ii, 72.*

Glabrous. *Stems* 6-15 in., suberect, branched, trigonous or trialate. *Leaves* ½-1 in. long, ovate or elliptic, subrhomboidal, cuneate and entire at the base; lower often petioled, crenate or denticulate,

sharply toothed along the upper half. *Pedicels* mostly equalling the leaves. *Corolla* $\frac{1}{10}$ in., pale-blue or white. The 3 upper anthers naked at the tip. *Capsule* $\frac{1}{2}$-$\frac{3}{4}$ in., triangular at the base and tapering to the pedicel. *Seeds* ellipsoid, compressed, not trigonous.

Dehra Dun (Gamble). Flowers during the rainy season. DISTRIB. W. Himalaya from Chamba eastwards to Sikkim and Bhutan up to 6,000 ft., Konkan, Deccan, Parasnath and Burma; also in Java, and Abyssinia.

2. WAHLENBERGIA, Schrad.; Fl. Brit. Ind. iii, 429.

Annual or perennial herbs. *Leaves* alternate or opposite *Peduncles* terminal or leaf-opposed, panicled. *Calyx* superior, limb 5-partite. *Corolla* campanulate, 5-lobed, sometimes to the base. *Stamens* free from the corolla; *filaments* often dilated near the base; *anthers* oblong, free. *Ovary* turbinate, 2-3-celled. *Style* cylindric; *stigma* (in the Indian species) of 3 narrow lobes. *Capsule* erect, 2-3-celled, loculicidally 2-3-valved within the persistent calyx-teeth.—Species about 80, chiefly in the S. Hemisphere, a few tropical and one European.

W. gracilis, *Schrad. Blumenb. p. 38; F. B. I. iii, 429; Collett Fl. Siml. 290; Cooke Fl. Bomb. ii, 74.* Campanula dehiscens, *Roxb. Fl. Ind. i, 504.*

A perennial herb, 6-18 in. high. *Stems* erect or decumbent, simple or divaricately branched from the base, glabrous or hairy below. *Leaves* sessile, $\frac{1}{2}$-$2\frac{1}{2}$ in. long, linear to obovate-oblong, more or less toothed, margins often thickened or undulate. *Flowers* in lax cymose panicles; pedicels long and slender; upper bracts linear, acute. *Calyx* $\frac{1}{4}$-$\frac{1}{3}$ in. long, tube turbinate; lobes linear from a triangular base, erect in fruit, persistent. *Corolla* $\frac{1}{3}$-$\frac{2}{3}$ in., campanulate, blue, deeply divided into broad oblong lobes. *Capsule* $\frac{1}{4}$-$\frac{1}{3}$ in. long, tapering into the pedicel. *Seeds* ellipsoid, compressed, smooth.

A common weed. DISTRIB. Throughout India and in Ceylon, ascending to 7,000 ft. on the Himalaya; also in China, Australia, N. Zealand, and S. Africa.

3. SPHENOCLEA, Gærtn.; Fl. Brit. Ind. iii, 437.

An erect annual. *Leaves* alternate, lanceolate, entire. *Spikes* lateral and terminal, peduncled, cylindric, dense-flowered, apex conical. *Flowers* small, sessile; bracteate and 2-bracteolate. *Calyx* $\frac{1}{2}$-inferior; limb 5-fid, segments ovate. *Corolla* campanulate, epigynous, 5-lobed. *Stamens* 5, on the corolla, alternate with its segments, *filaments* short, linear, *anthers* ovate. *Ovary* at first

inferior, 2-celled; *ovules* very many, on stalked placentas; *style* short, *stigma* obscurely 2-lobed. *Capsule* ½-inferior, membranous, cuneate and angled below, flat on the top, circumscissilely dehiscing at the margin of the calyx-tube. Seeds narrowly oblong; testa somewhat lax.—A single species distributed throughout the warmer regions of both hemispheres.

S. zeylanica, *Gærtn. Fruct. i, 113, t. 24; Roxb. Fl. Ind. i, 507; F. B. iii, 438; Cooke Fl. Bomb. ii, 75.*

Stem 1-3 ft. high, stout, simple or branched, glabrous. *Leaves* sessile or shortly petioled, 2-3 in. long, narrowed at both ends, glabrous. *Flowers* greenish-yellow, in dense spikes which are ¾-2 in. long, the peduncles of spikes 1—2 in. long. *Calyx-lobes* triangular, ⅛ in., somewhat enlarged and inflexed in fruit. *Capsule* ¼ in. in diam., wedge-shaped and angled below, crowned above with the persistent calyx-lobes. *Seeds* minute, microscopically scabrous.

Abundant in swamps. Flowers in *Oct.* DISTRIB. Throughout India and in Ceylon, and in warm regions of both hemispheres.

4. CAMPANULA, Linn.; Fl. Brit. Ind. iii, 438.

Perennial or annual herbs, erect or decumbent. *Leaves* alternate, or the radical subrosulate, from ovate to linear. *Flowers* peduncled or subsessile, axillary or terminal, panicled spicate or subcapitate, purple or white. *Calyx-tube* adnate to the ovary, turbinate; limb deeply 5-lobed, persistent. *Corolla* campanulate, usually 5-fid. *Stamens* 5, free, *filaments* dilated at the base, *anthers* free. *Ovary* inferior, 3-(rarely 4-5-) celled; *ovules* very many in each cell; *style* cylindric, *stigma* shortly 3-5-lobed. *Capsule* obovoid or elongate, truncate, dehiscing by small valves at the base or on the sides outside the calyx-lobes. *Seeds* ellipsoid or compressed and margined.—Species about 230, natives chiefly of the north temperate hemisphere and in the mountainous regions of Asia.

C. canescens, *Wall. Cat. 1289; Royle Ill. 253; F. B. I. iii, 439; Collett Fl. Siml. 291.*

An erect hispid herb. *Stems* 6-24 in. high. *Leaves* 1-2 in. long, oblong or lanceolate, crenate. *Flowers* many, in panicled clusters, dimorphic, both forms often on one stem, the one complete and the other smaller (cleistogamic) with neither corolla nor stamens. *Calyx-teeth* linear-lanceolate, ¼ in., but scarcely half that size in the imperfect flowers. *Corolla* ¼ in. long, broadly campanulate, greyish purple, lobes short. *Ovary* 3-or occasionally 5-celled. *Capsule* ¼-½ in. in diam., or in the imperfect flowers much smaller. *Seeds* very minute, hardly compressed.

In the Kheri district of N. Oudh (Duthie's collector), Moradabad in Rohilkhand (T. Thomson), and probably in many other localities. Flowers during March. DISTRIB. Punjab, Bengal and Central India, also on the Himalaya up to 5,000 ft. It extends to Afghanistan, Ceylon, Burma, and China.

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